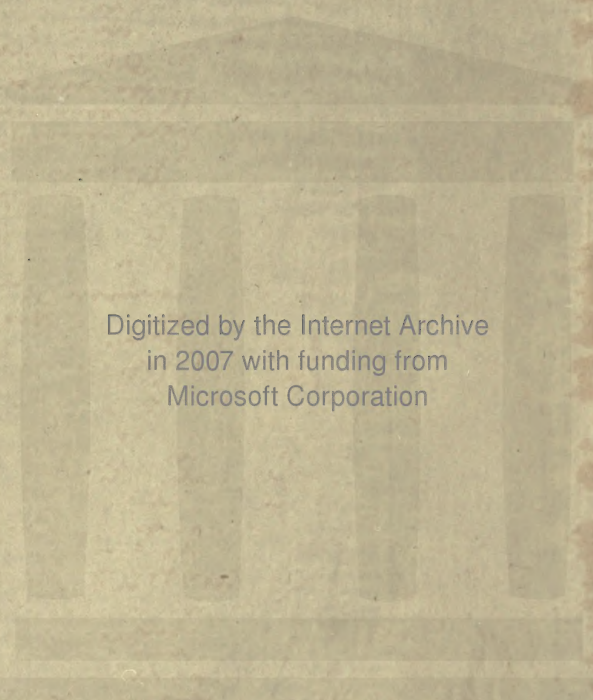


MACMILLAN'S PRACTICAL MODERN GEOGRAPHIES

A JUNIOR GEOGRAPHY
OF THE WORLD
B. C. WALLIS

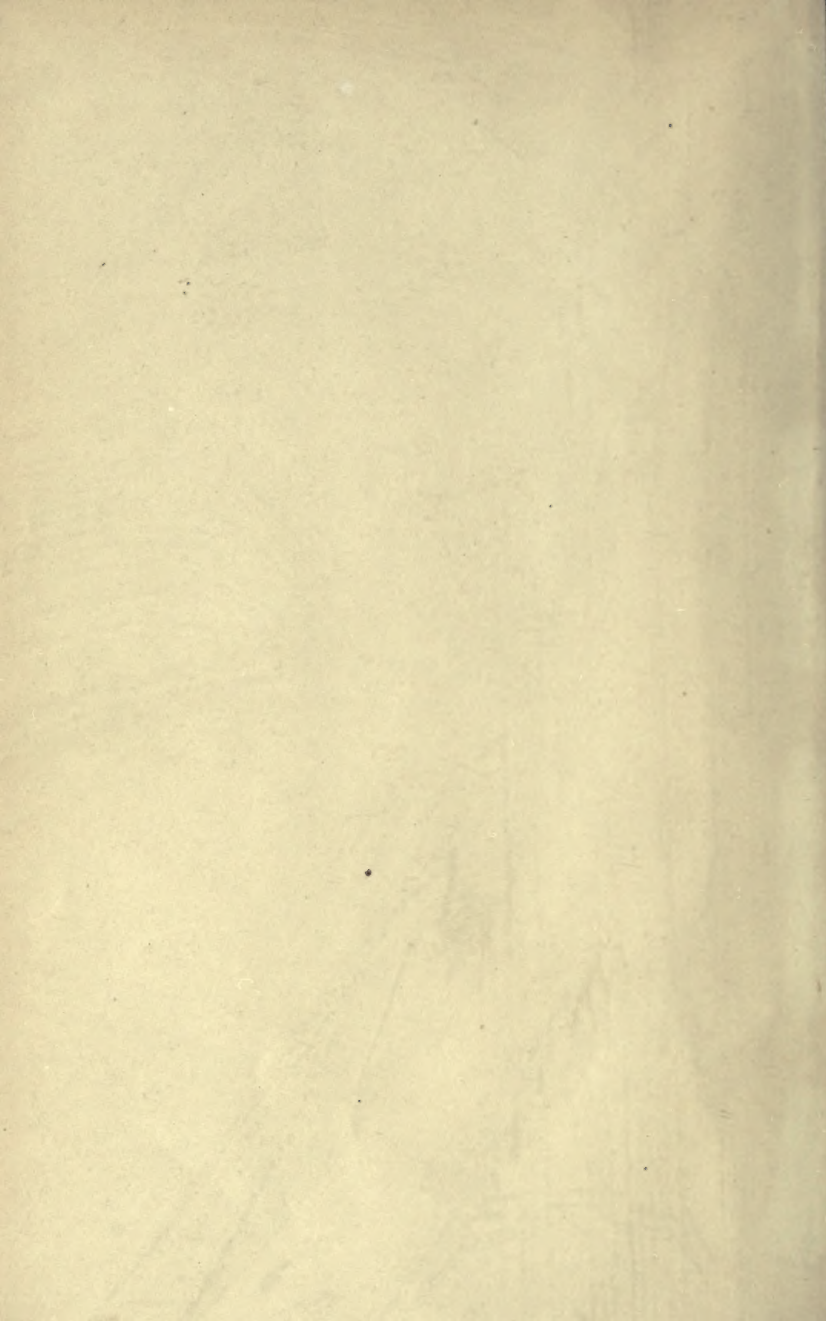


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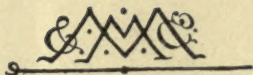
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MACMILLAN'S
PRACTICAL MODERN GEOGRAPHIES

A JUNIOR GEOGRAPHY OF THE WORLD



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TORONTO

A JUNIOR GEOGRAPHY OF THE WORLD

BY

B. C. WALLIS, B.Sc.(LOND.), F.R.G.S.

FELLOW OF THE COLLEGE OF PRECEPTORS

FELLOW OF THE ROYAL STATISTICAL SOCIETY



161947.
18.5.21.

MACMILLAN AND CO., LIMITED
ST. MARTIN'S STREET, LONDON

1920



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First Edition 1913.

Reprinted 1914, 1915, 1917, 1918, 1919,
(with corrections) 1920 (three times).

GLASGOW: PRINTED AT THE UNIVERSITY PRESS
BY ROBERT MACLEHOSE AND CO. LTD.

PREFACE

AT the Junior Stage, children are concerned mainly with learning the shorthand of geography and the main facts with regard to the life of man upon the earth. For this reason an attempt has been made in this book to provide a fairly large number of illustrations of geographical shorthand, and to present an account of the world based upon an estimate of the relative importance of the workers in one country in comparison with those who labour in other lands.

It is suggested that attention should be paid to the practical work and to the exercises, since at this stage in the study of geography the pupil should work very largely for himself. At the same time, the habit of self-reliance, which individual work engenders, will facilitate the quick grasp of generalisations, and the world outlook, for which material is supplied in my larger volume, *A Geography of the World*.

Hearty thanks are due to the publishers for their lavish supply of maps and pictures ; to the Editors, Sir Richard Gregory and Mr. A. T. Simmons, for their cordial sympathy and many suggestions ; to Messrs. Emery Walker, Ltd., for great care in making the maps and diagrams, which appear to me to be of special excellence ; and to Miss H. G. Whitton, for her suggestions and careful reading of the proofs.

Permission has been kindly granted by the Royal Geographical Society to make Fig. 22 from a map published in *The Geographical Journal* ; by Messrs. John Bartholomew & Co. to make use of *The Atlas of Meteorology* in the construction of Fig. 140 ; and by Messrs. Gall & Inglis to reproduce Fig. 35 from their *Contour Road Book of England*. The Indian and United States Governments kindly supplied photographs and maps to illustrate plane-table surveying.

Acknowledgment of permission to use photographs is due to Mr. A. Burt of New Zealand.

For those teachers who so desire, I have carefully selected a set of stereographs for use in revising and emphasising the chief features of the world. Applications should be addressed to Messrs. Underwood & Underwood, 104 High Holborn, London, W.C.

Messrs. Underwood & Underwood have courteously allowed me to use the method of indicating on a map the limits of an area shown in a photograph in Fig. 37 ; this method is their patent.

A set of seven exercise books which I have prepared dealing respectively with the geography of (i) the British Isles ; (ii) Europe ; (iii) the British Empire ; (iv) the Americas ; (v) Asia and Australasia ; (vi) Africa ; (vii) Physical Geography, provides further material for homework and class exercises. A set of Keys to these books is now published.

Opportunity has been taken to make a few of the more vital corrections consequent upon the war ; but these have necessarily been limited in number.

B. C. WALLIS.

OCTOBER, 1919.

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ABBREVIATIONS IN USE

MANY of the Exercises are based upon Examination questions set by the authorities named below. An asterisk indicates that the question has been modified.

Cambridge University Locals		(C.U.L.)
Oxford	" "	(O.U.L.)
London University		(L.U.)
Calcutta	" "	(Cal. U.)
Melbourne	" "	(Melb. U.)
Panjab	" "	(Pan. U.)
College of Preceptors		(C.P.)
Central Welsh Board		(C.W.B.)
Civil Service Commission		(C.S.C.)
London County Council		(L.C.C.)
Scotch Education Department		(Sc. Ed. Dept.)
New Zealand	" "	(N.Z. Ed. Dept.)
Manitoba	" "	(Man. Sch.)
Ontario	" "	(Ont. Sch.)
Cape of Good Hope Education Department		(C.G.H.)
Madras	" "	(Mad. Sch.)
Newfoundland	" "	(Newf. Sch.)
Alberta	" "	(Alb.)
New South Wales	" "	(N.S.W. Ed. Dept.)
Victoria	" "	(Vict. Ed. Dept.)
South Australia	" "	(S.A.)
London Chamber of Commerce		(L.C. Com.)

PART I.

THE WORLD IN GENERAL.

1. Introductory.

What is Geography?—The name geography is given to the story of the present life of men upon the earth. Men are of many races ; some are white in colour like Britons, others are yellow like the Chinese, still others are black, like the negroes. Geography describes where these men live, what kind of work they do, why they work at all, and the kind of country in which they work.

White men inhabit the continent of Europe ; some of them live near the sea-shore, and are fishermen ; others live on the plains, and till the ground and rear cattle ; others live on the hill-sides and rear sheep. Many men in Europe work in coal or iron mines, and many others live in the cities, where they manufacture or sell various articles. It would be a long process to describe for each little part of Europe how men live as fishers, or farmers, or miners ; geography, in consequence, groups men together, and shows the ways in which, for example, the farmers of one district resemble the farmers in all the other districts of Europe where farmers live. The geographer studies men in groups according to the work they do, and the kinds of places where this work is carried on.

All over the rest of the world, where men live, there are groups of workers ; and some of these groups resemble the groups of Europe, but others are so entirely different both in their work and their surroundings that they form groups by themselves.

All groups of men, who are at work in the world, are not equally important. Some are entirely selfish ; they live in little villages entirely separate from their fellow men, and the doings of the men who live elsewhere interest them very little. On the other hand,

there are groups of men whose work is entirely for the benefit or comfort of people who live in other lands ; these men would lose their means of earning a living, if other people suddenly ceased to use the results of their labour. Such people are the sheep-farmers of New Zealand, and many of the cotton operatives of South-east Lancashire. Consequently, the story of geography deals more fully with the work and lives of those men who are deeply interested in the lives of other men, often thousands of miles away over the sea.

The lands men inhabit.—Men work either in factories, or in the fields, because the kind of work they choose to do pays them best ; the geographer attempts to find out why such work pays such men best. This inquiry as to the reasons why different men do different kinds of work causes the geographer to take notice of the different kinds of lands in which men dwell, to notice where the plains and mountains are, to discover why certain occupations are entirely carried on in the plains, and to find what effect the mountains have upon the lives of men. Consequently, the geographer describes the surface of the land, the uplands and the lowlands, the rivers which help men to communicate one with another, and the mountains which, sometimes, serve to keep men apart. Part of the geographical story deals, then, with what is called the **relief of the land**. But the plains in some parts of the world are **desert**, and support only a very few men or animals : some lands are desert because it is too hot, and dry ; other lands are desert because it is too cold. Again, the farmer finds that some countries are too hot, or too wet, or too cold to grow wheat successfully. Similarly with other plants, each has its particular kind of place in which it will grow well, and yield to man satisfactory results for his work. Consequently, part of geography deals with the kind of weather, or **climate**, which men find in different countries ; and lands are described as tropical or hot countries, or as temperate or cool countries, because these descriptions indicate at once the kinds of life which men can live in those lands.

The main parts of geography deal, therefore, with the lives of men and the work they do, the lands they inhabit, the climates they experience, and the vegetation which those lands and climates render possible. The more important parts of geography are those which deal with the lands wherein many men dwell, especially where many men are at work in the service of other inhabitants of the world.

How the story of the lands is told.—It is difficult to tell the story of different lands entirely in words, and so geographers make use of **maps** for convenience in description. The story of the lands was first told by means of maps of coast lines or great highways ; later, rivers and towns were marked on the maps, and nowadays geographers use a map, sometimes called a political map, to show where places are with regard to rivers, coasts, roads, and the more important railway lines.

But such political maps do not serve as summaries of the relief of a country, and geographers now make great use of **relief maps** to show the mountains and the plains, the uplands and the valleys. The power to read such maps results from the study of geography.

How the story of the climates is told.—For similar reasons of convenience, geographers describe the climates of the various parts or regions of the world by means of maps showing the winds, the rainfall, and the temperature or degree of warmth of the air.

There are many examples of such maps in this book, and no one can learn the story of geography who cannot read such maps easily. But the climate of a place changes with the seasons ; it differs in the month of January from what it is like in the month of July. Consequently, the geographer also studies the changes in the climate, and for this purpose he uses lists of numbers which show these changes. Examples of such lists of numbers, and of the diagrams which are used to help in their study, occur in the subsequent pages.

How the story of the vegetation is told.—Maps are again used for the study of vegetation. Such maps show where the land is desert, where the trees and forests occur, where there is always grass, and so on. Other maps of the same kind are made to show where the great crops of the world, such as wheat and rice, are grown. But some lands which grow wheat do not grow it well, and some lands which are grass lands do not provide nourishment for many animals for men's food ; consequently, the geographer pays attention to the numbers which show the value of the crops of wheat and rice, or how numerous are the sheep and cattle. He uses these numbers to compare one country with another, and sometimes makes diagrams of his results to summarise them in a convenient way.

How the story of man's work is told.—The most convenient way of showing the work which men do in different parts of the world is to show the kinds of things which they produce or grow,

and to show the way in which they dispose of these products by means of trade. Consequently, geographers make maps to indicate the products of the various lands, and to show the articles which man receives, or **imports**, from other countries as well as the articles which he sends, or **exports**, to other countries.

SUMMARY.

Maps, then, are the shorthand of geography, and the power to read a series of maps showing relief, climate, vegetation, products, etc., and to imagine from these maps the men who live and work in these countries, is the power of mind at which the geographer aims. Boys and girls study geography in order that they may know the world and the men who are at work in it, and thus may do their share of the world's work thoroughly well when they leave school and become citizens. Their knowledge of geography should help them to become better men and women, to assist in making the world a better abiding place for its inhabitants.

Geography describes how men live and work. It shows how their lives depend upon the lands they inhabit. It indicates how men's work depends chiefly upon the kind of climate which occurs where they live.

2. The People in the World.

1. On an outline map of the world, traced from the world map in your atlas, mark the rivers Ganges, Hoang-ho, Yang-tse, Rhine, Nile and Hudson, taking special care to mark the deltaic mouths when they occur. Name the Great European Plain, the Alps, the Eastern Coastal Plain of North America.

Write as briefly as possible what you understand by a delta.

Distribution of the population.—The number of people who inhabit a square mile of the land, *i.e.* the average density of the population, differs very greatly between country and country, as well as between one small area and other small areas in the same country. For example, in some of the parishes in the county of Sussex the density of population is less than 50, and in other parishes in the same county it is more than 500 per square mile.

Fig. 1 shows the regions of the world where the population is dense. The most crowded regions are in the valley of the Ganges in India; in the lower portions of the valleys of the Hoang-ho and



Water Hemisphere

Land Hemisphere

F = fishers C = collectors H = hunters
T = tillers of the ground R = ranchers

over 400 per sq. mile
100-400 " " "
under 100 " " "

FIG. 1.—THE WORKERS OF THE WORLD.

(Britons are tillers, fishers, ranchers and manufacturers.)

the Yang-tse in China ; in the lower Nile Valley in Egypt ; and in Western Europe—in the lower Rhine Valley and in Lancashire to the west of the Pennine Upland in England. In all these districts the people are crowded together to the extent of more than 400 on each square mile.

Surrounding these areas, except that of the Nile Valley, are districts where the density ranges from 100 to 400 per square mile. Fig. 1 shows, therefore, that practically the whole of India, almost the whole of the Chinese coast lands, and Western Europe contain many people.

The densest population in the American Continent is in the neighbourhood of the Hudson Valley, westward from New York. In the world, then, there are five comparatively small areas which contain many people, and the remainder of the land surface is sparsely inhabited, or not inhabited at all.

The problem of geography.—The distribution of the people, as shown in Fig. 1, provides the geographer with his chief problem. How is it that the people are crowded in these districts? How do these people live? What work do they do? Why do these people remain crowded in one region, and why do they not populate the empty places of the earth? These are the questions which the geographer tries to answer regarding man's life upon the earth.

A partial answer.—In a general way, Fig. 2 provides a first step towards solving this problem of the distribution of population. By a comparison of Figs. 1 and 2 it becomes clear that the dense regions of population are usually lowlands and river valleys, and that the regions of high mountains, such as the Alps in Europe, the whole of Western America, and the Himalayas in Asia, are sparsely inhabited.

Fig. 2, however, does not supply a complete answer with reference to the uplands ; *e.g.* the upland of the Deccan in India is well peopled in comparison with the upland of Western Australia, and the plateau of Spain is more populous than the plateau of Africa.

Fig. 2 does not provide a complete solution, because it does not indicate why the lowland of North-western Asia and that of the lower Mississippi valley are less populous than the five areas of dense population previously mentioned. So it happens that this geographical problem requires additional study, a study which probes deeper and deeper into details, and in the end provides some explanation of the life of man upon the earth.

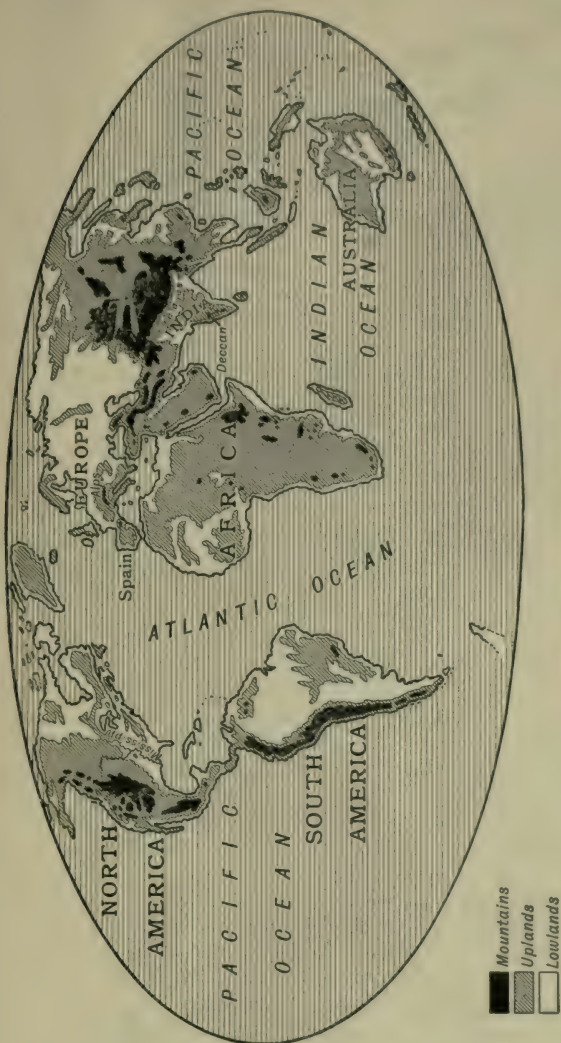


FIG. 2.—THE RELIEF OF THE WORLD.

A second partial answer.—Fig. 1 contains some information about the work mainly performed in the various parts of the world. First, there are the groups of people who prey upon animals and plants for their food or for their livelihood ; these are hunters or fishers, *i.e.* **collectors** of natural produce. Such men live by destruction. The **hunters** who live near the Arctic Ocean or near the equator—*i.e.* in the coldest and hottest regions of the world—kill animals. They feed upon the flesh of the animals ; they use the skins of the animals for clothes, or for trade, whereby they exchange the skins for articles they need. The collectors, who live in the equatorial lands, procure feathers from the birds, collect rare plants or rubber or camphor from the forests near which they live, and in their work they usually damage or destroy the plant or animal on which they prey.

Fishers are at work in many of the oceans, and destroy life that they themselves may live.

The collectors who work in the cold forests in the north of Europe and America destroy trees by cutting them down to provide timber for human use.

On the other hand, there are two groups of workers who preserve life ; they are the tillers of the ground and the ranchers indicated in Fig. 1. The **tillers** of the ground cultivate grains such as wheat, or rice, fibres such as cotton or flax, articles of food such as fruits or sugar plants. They work at preparing the ground, sowing the seed, and reaping a harvest in due season.

The **ranchers** have flocks and herds of sheep or goats or cattle. They preserve their animals from danger, house them when the weather would harm them, so that, as a result of their care, their flocks and herds increase. The surplus animals may then be used for food, and the animal products, such as milk or wool, may be used for food or for clothing.

On the whole, all the people who are tillers or ranchers aim at preserving animal and plant life so that they may live : they inhabit, as a rule, the temperate regions of the world, where it is not so hot as in the tropics, and where it is not so cold as it is on the lowlands which fringe the Arctic Ocean.

No reference is given in Fig. 1 to the kind of work which occupies the crowded peoples of the five maritime districts. In all cases some of these people are tillers of the ground or ranchers, but there are also—especially in Western Europe and Eastern North America—**manufacturers**, people who make articles to be used by

others, articles of clothing, articles of use in transport, such as railway engines or ships, and so on.

No mention also is made in Fig. 1 of the **miners**, the men who obtain from the earth gold and coal and other minerals for human use; nor of the **traders** who buy and sell the goods obtained or produced by others.

All people are not alike.—Fig. 3 distinguishes between the different kinds of people. Most of Asia and parts of America are

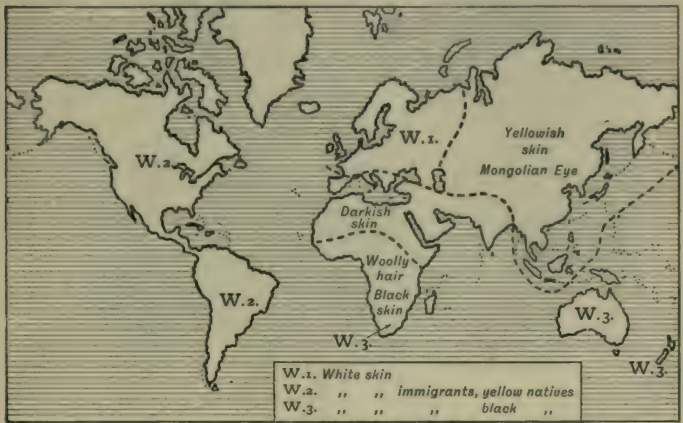


FIG. 3.—THE PEOPLES OF THE WORLD.

(The yellow-skinned men of Asia are distinguished from the yellow-skinned men of America by their special kind of eye.)

peopled by men of the yellow type, men such as the Chinese or the North American Indian. The southern part of Africa and the western part of Australia contain men of the black type, such as the Hottentots and negroes and the few Australian aborigines. The remainder of the world is peopled by men of the white type who vary from the Briton to the brown-skinned Hindu in India and to the Berber in North Africa. A comparison of Fig. 3 with Fig. 1 shows that the kind of work which men do is not a matter of race, for there are black men who till the ground, and there are yellow men who manufacture.

The Chinese have peculiar shaped eyes, called Mongolian eyes (Fig. 4). This fact distinguishes one race of men from all others, and this race of men is native in Asia (Fig. 3).

Negroes have peculiar kinky hair, and this serves to distinguish their race from all other races with straight hair or hair which curls in waves. Kinky-haired, *i.e.* woolly-haired, men are native in Africa (Fig. 3).

Such men are both farmers and manufacturers; in some of the negro villages, for example, there are workers in iron.

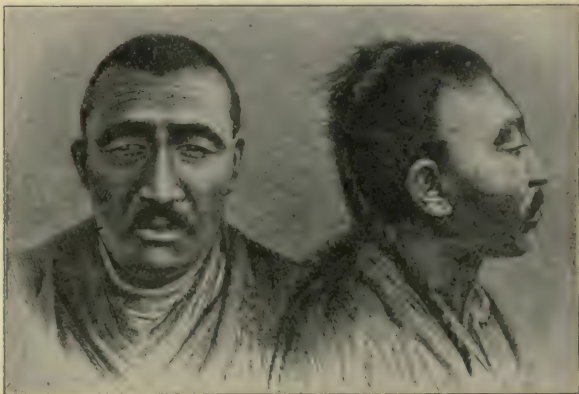


FIG. 4.—THE MONGOLIAN EYE.

It is the business of geography, however, to describe why different types of men work in different ways to different degrees, why, *e.g.*, the manufacturing is almost entirely done by white men, while hunting and collecting are rarely the work of white men.

SUMMARY.

The deltas at the mouths of the Rhine, Ganges, Yang-tse are densely populated.

People crowd together on the lowlands, and are scattered over the uplands of the world.

People are (i) hunters, (ii) fishers, (iii) tillers, (iv) ranchers, (v) manufacturers, (vi) miners, (vii) traders.

3. Boatmen, Fishers, Sailors.

1. Examine Fig. 5. Find Egypt, Newfoundland, Mesopotamia, New Zealand. Make a tracing of a map of the world and insert the names of Cape Horn, the Azores, the Canary Islands, the Strait of Magellan,

Davis Strait, Hudson Bay, the White Sea, the West Indies, the East Indies and Bering Strait. When you have finished reading this chapter, mark on this map the routes of John Davis, Columbus, Magellan, in their great voyages.

2. At the first convenient opportunity, visit the nearest museum and examine any boats which are exhibited. If there be no boats, you may find models of boats as used in various parts of the world. Write a short description, with sketches if possible, of the things you examine.

Primitive boats.—Hundreds of years ago in Europe and Asia men found rivers, lakes, and the sea a hindrance to their movements. It must frequently have happened that they desired to cross the water, and they must have found out that they could cross by a method of paddling, provided they had the assistance of some object which could float.

From this discovery, primitive men made various kinds of boats : one of the earliest of these was the **dug-out**, which was made by hollowing a tree trunk in such a way that it would usually float with the hollow part upwards. Some dug-outs are at least thirty feet long. The power of a dug-out to float is increased by adding planks along the side, and this probably led to the construction of boats entirely made of planks. Boats of this kind would only be made in countries which were forested. In other lands where trees were not so plentiful boats were made from bark, or from skins and wicker-work.

An interesting example of the skin boat is the **kayak** of the Eskimo ; this is made of seal-skin tightly stretched over a frame, and is usually occupied by one person, who ties himself in and so makes the boat like a bladder. On the Euphrates boats are frequently made of several inflated sheep-skins fastened together by slender poles. The boatmen sail down the river with a cargo, sell the cargo, deflate the skins, and return home by land, taking back the skins on the backs of asses which they have carried downstream in the boat.

Neither in Greenland nor Labrador, where the Eskimo lives, nor in Mesopotamia, near the Euphrates, are trees plentiful.

Where trees are plentiful, a simple boat is made of trunks fastened together to make a raft : an improvement on the raft occurs when boats are made of a platform supported on two trunks ; later the trunks were shaped with pointed ends so as to move more easily. Later still, the boats were made of one long narrow trunk, hollowed out, with a second smaller trunk fastened to it by means of a



FIG. 6.—BOATS.

1. Dug-out.
2. Roman trireme.
3. Nile boat.
4. Pacific out-rigger boat.
5. Fishing smack.
6. British lifeboat.
7. Eskimo kayak.
8. Chinese junk.

platform. Such a boat is steady enough to carry a sail, and from it has been developed the **out-rigger** boats such as that in Fig. 6.

Scattered in different parts of the world, we find boats of all these kinds.

Specimens of such boats, or models of them, are placed in museums as relics of the stages by means of which man has improved his power to navigate the rivers and lakes.

Rowing and sailing boats.—The simplest boats were used to move with the current down a stream or river, but as soon as men desired to go against the river, or across a lake of still water, or along the coast by the sea, they found that they must make the boats move. Hence men made boats with oars or with sails, and sometimes with both oars and sails.

One example of a simple sailing boat still in use is found on the river Nile. Winds blow from the north up the valley of the Nile very frequently, and for hundreds of years men have sailed with the wind against the current in boats such as that in Fig. 6. When they wish to return home, they lower the sail, and the current carries them with it to their journey's end.

Coasting voyages.—Simple rowing boats, and simple sailing boats, rarely venture far out to sea, because they are so easily wrecked in a storm. Consequently, the early sailors only voyaged along the coasts when the weather was calm or the winds were favourable. In the Mediterranean Sea, off the coasts of China, and in the North Sea, sailors voyaged along the coasts; and gradually the more daring went further and further from the land, until in time they were able, like the Vikings who invaded England in Saxon times, to cross the seas from one side to the other in open sailing boats (Fig. 7).

Such daring sailors led others to make voyages during which they lost sight of the land. Similar voyages were made in early times in the Mediterranean Sea and in the east. These early navigators made use of islands on their routes; consequently, the islands between Greece and Asia Minor, the islands of the East Indies, as well as the Orkney and Shetland Islands and the Western Islands off the coasts of Scotland, were frequently visited by the most daring sailors of ancient times.

Such islands have lost much of their importance, because sailors no longer need make them places of refuge, or ports of call.

Early ships.—Before the year 1800, ships were very small, and were made of wood only. Until the year 1400 very few sailors

dared to sail far away from land in the Atlantic Ocean, but between 1400 and 1800 the North Atlantic Ocean was the scene of many daring voyages in ships of about 100 tons or less (Fig. 7). These ships were built in the countries where there were large forests ; consequently, Portugal at first, and England during later years, were countries where many small wooden ocean-going ships were built.

Early discoverers.—The early voyages across the Atlantic Ocean led to the discovery of the Canary Islands and the Azores (Map, p. 11). Sailors brought back word from these journeys that the winds blew steadily westwards over the ocean, and this piece of news became generally known at the time when men in the south of Europe found that they could no longer trade with China, or Cathay, as it was then called, by land, because the Turks had closed the trade routes overland. Some men thought that they might reach Cathay by sea, and so **Columbus** set out for the Indies, which were known at that time as a part of Cathay. He discovered America, and from his days men began to explore the coasts of the new land.

Columbus's ships and those used by his successors were small, and were not fitted with a deck which completely covered the inside of the vessel, yet many men dared the dangers of the ocean to engage in the hunt for new stores of gold such as those which had been found in America.

Other men visited the north of America, and found that whales were numerous in the seas near Newfoundland ; hence grew up a regular whale fishery, conducted by men who lived in the north of Europe.

As the coasts of America were explored, it was eventually found that in South America there was a strait which led to another large ocean, the Pacific. **Magellan** went through this strait, and his ships were brought home to Europe across the Pacific Ocean, across the Indian Ocean, round the Cape of Good Hope, and thus some men had sailed round the world. Magellan had been killed in the Pacific, and did not share in the honour which fell to his crew. Meanwhile, other men had sailed from the Atlantic Ocean round the Cape of Good Hope to India, and had begun an ocean-going trade with Cathay.

Consequently, by the time of Queen Elizabeth, whose reign ended in 1603 A.D., Englishmen, Frenchmen, Dutchmen, Spaniards and Portuguese, as well as men from Genoa and Venice in Italy, had



FIG. 7.—SHIPS.

1. Viking ship.
3. Columbus's ship.
5. British wooden battleship.
7. British steel battleship.

2. Ship of the Middle Ages.
4. Ship of the time of Drake.
6. Early iron ship.
8. The "Titanic."

grown accustomed to think of voyages across the great oceans, chiefly for purposes of trade or plunder.

The North-West Passage.—Some Englishmen at this time thought that they could reach Cathay by going round the north of America, as Magellan and **Drake** had gone round by the south. They attempted to make what they called the North-West Passage: they failed because the cold and darkness of the winter in the neighbourhood of Greenland (Fig. 5) prevented them from continuous work through several years. One of the greatest men who attempted to discover this route was **John Davis**, whose name is still used on maps to denote Davis Strait.

It is noteworthy that only quite recently, **Roald Amundsen**—who has since been the first man to visit the South Pole—took a ship through the North-West Passage; he was able to do this because he was so well supplied with stores and food that he could spend the dark winter months in a camp in the north of Canada.

Modern ships.—The nineteenth century has seen many changes in ships. About the year 1810 men first built ships of iron; about the year 1860 ships were first built of steel.

The discovery of the power of steam-engines enabled men to make steamships, and the result of a hundred years of progress is seen in ships like the "Olympic," which crosses the Atlantic in less than five days.

Steamships first enabled the sailor to conquer the weather: John Davis, on his voyage to the North-west, was kept for a fortnight at the Scilly Islands, off the south-west corner of England, waiting until the wind blew in such a way that he could sail his ships in the direction of Greenland; nowadays, ships leave the harbours with the punctuality of railway trains.

SUMMARY.

Lakes and oceans have always interfered with the progress of man, who tries to conquer nature by building boats and ships.

The first boats merely floated like a raft, and were at the mercy of wind and waves.

Sails and oars were first used to conquer wind and waves; then steam-engines helped the sailor to fight wind and waves better.

The winds and waves sometimes conquer the sailor, for ships are wrecked or disabled: every winter some disabled steamships seek safety from Atlantic storms in Queenstown Harbour.

4. The Land and the Sun.

1. Trace an outline map of the world. Mark on the map the tropics of Cancer and Capricorn. Between the North Pole and the north tropic write the phrases—"Summer—June to August; winter—Dec. to Jan."; between the tropics write—"Always hot, rainy seasons and dry seasons"; between the south pole and the south tropic write—"Summer—Dec. to Jan., winter—June to Aug." Name Japan and mark from Fig. 13 the districts where there are volcanoes.

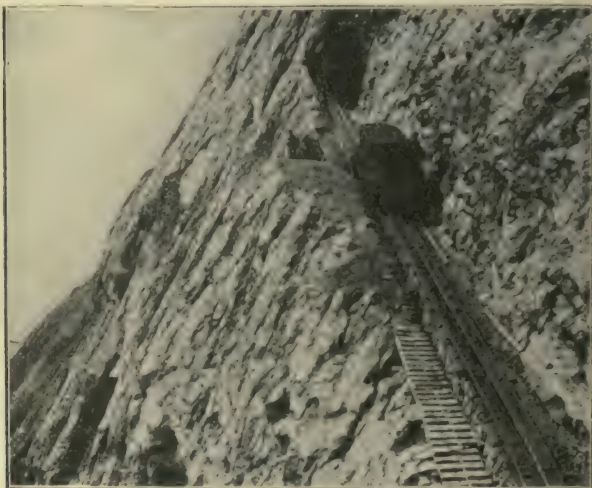


Photo Underwood & Underwood

FIG. 8.—TUNNEL ON A MOUNTAIN RAILWAY IN THE SWISS ALPS.

The effect of the sun.—In the last chapter it was indicated that man had conquered nature almost completely in connection with the sea. But man has not been so successful in regard to the sun and to the land. The sun warms the air and the earth.

Near the poles the sunshine only warms the air slightly, and even in the short summer season it is so cold that except for occasional explorers man does not attempt to work in the polar regions.

Further from the poles the sun's heat makes a summer season when man can work, but during the cold winter men are almost entirely idle. In the cold districts of **Canada** and **Siberia**, when the

rivers are frozen and the land covered with snow, nature forces men to rest from their labours. They cannot till the ground ; they must protect their flocks and herds ; and only the hunter and the timber collector find employment.

Nearer to the equator still, where the winter and summer seasons do not differ so greatly, man works all the year round.



Photo Underwood & Underwood.

FIG. 9.—ZIG-ZAG MOUNTAIN RAILWAY AT AN AMERICAN COPPER MINE.

In the tropics, where the sun is very powerful all the year round, and where there is no winter, man does not work at midday.

Man, therefore, cannot conquer the seasons ; he depends on the sun.

The land.—Nature offers obstacles to man's progress even on land. Mountains and hills are barriers, which he tries to surmount. Earthquakes occur and bring devastation and ruin in their train. Volcanoes cover the land with lava and destroy villages and towns ;

and the relics of ancient volcanoes leave a soil which man finds it difficult to till.

Mountains and hills.—Man tries to conquer the mountains and hills. He makes tunnels through these barriers ; Fig. 8 shows a picture of one end of a tunnel through the **Alps**. The low hills of England are frequently tunnelled ; the **Pennines** and even the lower hills like the **South Downs** are pierced by these triumphs of man's



Photo B. C. Wallis

FIG. 10.—A BRIDGE ACROSS A VALLEY.

The upper bridge or viaduct carries the main road to Paris. There is a lower bridge just above the level of the river, can you find it in the picture ?

ingenuity. In places, however, man must make his railways round the barriers or over them : Fig. 9 shows a picture of a zig-zag railway over a mountain barrier ; the mountain sides are too steep for the trains to climb by a direct path and so the track winds in loops and curves up the slopes.

Valleys.—In the South-western United States the Colorado River (Fig. 13) flows through a famous cañon or valley which has the steepest sides and is the deepest in the world : man has not yet attempted to conquer the difficulties it places in his way. Fig. 10 shows how a valley may be bridged.

Rivers and waterfalls.—The barriers which rivers make are usually overcome by means of bridges, such as the Forth Bridge (Fig. 11); and man harnesses the waterfalls. In Switzerland, among the mountains of the Eastern United States, and at the Niagara Falls, the waterfalls are used to drive machinery which makes electrical power to drive machines and tram-cars, and to light towns and cities.

But many rivers are of little use to man since they are too rapid. For example, most of the rivers of Japan flow so rapidly that only



FIG. 11.—THE FORTH BRIDGE, SCOTLAND.

Compare the material and the number of piers of this bridge with those of the bridge in Fig. 10.

a few boats are used to navigate them. Fig. 12 shows such a boat.

Earthquakes.—Earthquakes are violent tremblings of the earth's crust; in some instances, the crust cracks and long fissures appear along the earth. The great devastation caused by the earthquake in California, which destroyed great portions of the city of San Francisco (Fig. 14), is a reminder of the way in which the earth refuses to be conquered by man's works. In Japan, earthquakes are so frequent that houses are only lightly built and of a single storey; stone is rarely used. In Wellington, New Zealand, the houses and other buildings are built similarly for the same reason.

Volcanoes.—When a hole or fissure occurs in the earth's crust and molten material pours out of the hole, this is a volcano. Sometimes the eruption of a volcano is accompanied by explosions, when quantities of rocky fragments and fine dust are thrown high into the air. The ruin which follows an earthquake is similar to that which succeeds the eruption of a volcano. The famous eruption of Mt. Vesuvius, which destroyed the town of Pompeii in Southern



Photo Underwood & Underwood

FIG. 12.—SHOOTING THE RAPIDS ON A JAPANESE RIVER.

(Note the forest-clad hill side and the seething water.)

Italy, will never be forgotten although it happened many hundreds of years ago. In recent times (1902) the eruption of Mt. Pelée wrought similar destruction in the West Indies (Fig. 13).

But the obstacles to human progress due to volcanoes do not end with the eruption ; volcanic areas, which are shown in Fig. 13, usually provide poor harvests. In Central France and in North Island, New Zealand, the soil is infertile because it consists mainly of volcanic material.

Active volcanoes are not so numerous as they were many hundreds of years ago. There used to be volcanoes in Britain, as may be judged from the lava deposits which occur in Cornwall and Scotland.



FIG. 13.—VOLCANIC AND OTHER DISTRICTS

SUMMARY.

The seasons are due to the heat of the sun. The cold season, winter, tends to hinder man's work. The great heat of the sun prevents man from working at midday near the equator.

Man surmounts the barriers of hills, mountains and valleys by tunnels and bridges. Earthquakes and volcanic eruptions destroy the work of man : buildings fall, crops are destroyed, fertile lands laid waste.



Photo Underwood & Underwood

FIG. 14.—THE EFFECT OF AN EARTHQUAKE, SAN FRANCISCO.

5. The Making of Maps.

1. Compare Fig. 15 with Fig. 2. Write out briefly the chief errors of the map made about 1500 A.D.
2. Compare Fig. 15 with Fig. 16. Write out briefly the chief improvements made between 1500 and 1600 A.D.
3. Compare Fig. 16 with Fig. 2. Write out briefly the chief errors in the map 1600 A.D.

Coast-line maps.—The maps which we find in a modern atlas represent the summary of the work of hundreds of explorers ; and

the knowledge of the shapes of the seas and the lands which they convey has chiefly been gained during the last 400 years, that is, since the discovery of America. It is not possible to describe completely the way in which all these maps have been made. One or two examples must suffice.

John Davis, one of the world's greatest seamen, was born in Devonshire, and lived in the time of Queen Elizabeth. When he was more than thirty years of age he made three voyages of exploration



FIG. 15.—A MAP MADE ABOUT THE YEAR 1500 A.D.

(Modern names are used.)

in the neighbourhood of Newfoundland, Labrador and Greenland. It was his habit to survey the coast-lines of the lands which he reached, to travel whenever he could into the interior of these lands, to describe the people whom he met—in this case the Eskimos—to note the conditions of the sea and the kinds of animals who frequented these countries. He was not the first to reach the shores of Greenland. Fig. 15 is a map made to show men's knowledge about the year 1500: it is based largely upon the explorations of Cabot. It shows that men thought that Ireland was nearly as

large as Great Britain, that Iceland was due north of the British Isles ; that America stretched without a break across the north-west corner of the Atlantic Ocean.

A hundred years later, about 1600, almost entirely as a result of the work of John Davis, this area was better known, as is shown in Fig. 16. Greenland was known to be separate from Canada ; the coast-line of Labrador, the size and shape of Newfoundland, were known more accurately. Iceland was more accurately fixed. Davis



FIG. 16.—A MAP MADE ABOUT THE YEAR 1600 A.D.
(Modern names are used.)

had discovered the great current in the ocean which flows in a southerly direction down the east coast of Greenland. Davis Strait was fairly well known. John Davis did his work so well that for more than 250 years men's knowledge of the coast-line of Labrador received little addition from subsequent explorers. Fig. 16 shows, on comparison with a modern map in an atlas, how much John Davis contributed to our knowledge of this part of the earth.

Latitude and longitude.—Work of exploration of this kind means that the explorer has to make regular measurements of latitude and longitude ; almost every day, and in many cases more frequently than every day, the explorer has to find out exactly where he is on the earth's surface.

Latitude is the angular distance north or south of the equator ; **longitude** is the distance in time or angle east or west of an imaginary line from the North Pole to the South Pole through Greenwich.

It is not necessary to describe in detail the ways in which explorers in the time of Queen Elizabeth took their observations for latitude ; it will suffice to imagine that a modern captain wishes to check the accuracy of the map which he is using. It must be supposed that he has reached a prominent cape, and that he thinks for some reason or other that the latitude and longitude of the cape are not marked correctly upon the map.

He waits until nearly mid-day ; then he measures the angular height of the sun when it is at its highest point in the sky, *i.e.* when it is noon. He records the time of this moment by a chronometer, which tells him the exact time it is at that moment at Greenwich. He then makes calculations, of which it will be enough to show here the principles.

Fixing longitude.—The captain has noted the exact time at Greenwich when the sun records noon where he is ; let it be supposed to be 4 p.m. This gives a time interval between Greenwich and the place of observation of four hours, which is equivalent to 60 degrees of longitude.*

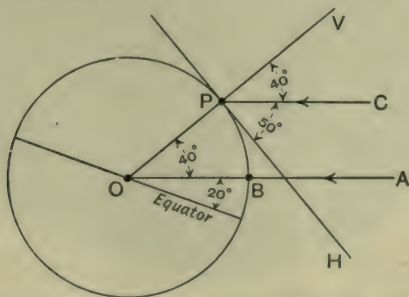


FIG. 17.—TO FIND LATITUDE FROM AN OBSERVATION OF SUN'S ALTITUDE.

Fixing the latitude.—The principle adopted will be clear from an examination of Fig. 17. *P* is the place of observation ; *B* is a place on the earth where the sun is overhead at noon on the day of observation. *B* is exactly south of *P*.

Sunlight falls on *B* by the path *AB*, and on *P* by the path *CP*, which are practically parallel. *PV* is vertical at *P*, and *PH* is

* 360° of longitude—right round the earth—are equal to 24 hours.

horizontal at P . Hence the angle CPH is the angle of the sun's angular height which the captain at P measures.

The angle CPV is equal to the angle BOP , which is equal to the difference in latitude between B and P .

The captain consults the *Nautical Almanac* to find for the day on which he makes the observations the latitude of B . All the latitudes



FIG. 18.—THE NORTH POLE STAR AND URSA MAJOR.

of places where the sun is exactly overhead at noon for all the days of the year are tabulated in the *Nautical Almanac*.

Suppose that the captain finds that the latitude of B is given in the *Almanac* as 20° . The angle CPH he has found by measurement to be 50° . Then angle CPV is 40° , i.e. angle POB is 40° , hence the latitude of P equals $40^\circ + 20^\circ$, i.e. 60° .

The captain thus finds that the latitude of P is 60° and the

longitude of P is also 60° . A moment's consideration shows him that the longitude is 60° W., and the latitude is 60° N.

Sometimes a captain fixes his latitude by means of the North Celestial Pole, which is near the North Pole Star. The angular height or altitude of the Pole is equal to the latitude of the observer. Fig. 18 shows how to find the North Pole Star in the sky. The group of seven stars, which is usually known as the Plough, belongs to a constellation called by astronomers Ursa Major (the **Great Bear**). The dotted lines in Fig. 18 indicate how the Pole Star may



FIG. 19.—FINDING THE ANGULAR HEIGHT OF THE NORTH POLE STAR.

(Note the position of the stars, which is that of the midnight sky in Autumn, *i.e.* November.)

be determined. Fig. 19 shows how the angular height of the Pole Star may be measured.

Distortions in maps.—Because the earth's surface is not flat but curved, and because a map is made upon a flat piece of paper, most maps of large areas are inaccurate; some parts at least are distorted. The map-maker, therefore, tries to keep the distortion as small as possible, and consequently an atlas contains maps which are made to fit net-works of lines of latitude and longitude which are arranged on different methods.

Fig. 5 (p. 11) is a map of the world on what is called **Mercator's projection**. The parallels of latitude are straight lines from west to

east, the meridians of longitude are straight lines at right angles to these. Fig. 13 (p. 23) is a map of the world made to show the areas of countries in correct proportion; the parallels are straight lines, but the meridians are curved. A comparison of these two maps shows that the results vary greatly. Mercator's map shows Green-



FIG. 20.—THE SOUTHERN SKY, SHOWING THE SOUTHERN CROSS AND DIRECTION LINES TO FIND THE SOUTH CELESTIAL POLE.

land, for example, to be much magnified; the equal area map shows Australia by rather a peculiar shape.

A good map.—A good map, therefore, shows the position of countries, rivers, mountains, etc., accurately; for the latitude and longitude of each place must be correctly shown. There should also be as little distortion of shape as possible. A good geographical map also shows accurately the parts of the country which are

lowland, upland and mountain, so as to give some idea of the relief of the land. Accuracy in map-making depends upon accuracy in surveying; and consequently the traveller who journeys nowadays to explore undiscovered countries frequently makes very careful surveys. Fig. 22 is an example of a map made from the results of explorations carried out in 1910 by a traveller who explored the part of Africa which is shown on the map (Fig. 22.)

Southern latitudes.—South of the equator the Northern sky is invisible, and the traveller can use the South Celestial Pole to fix

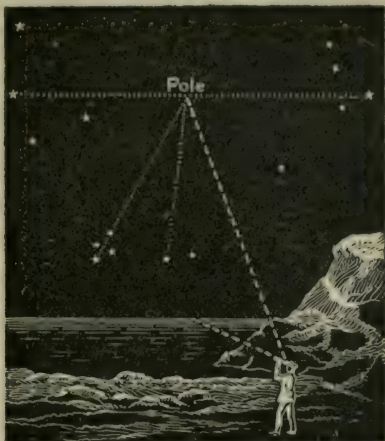


FIG. 21.—FINDING THE ANGULAR HEIGHT OF THE SOUTH CELESTIAL POLE.
(Note the position of the stars, which is that of the midnight sky in late Autumn, *i.e.* May.)

his latitude. Fig. 20 shows a prominent group of stars called the **Southern Cross**, and the method of finding the pole. When the traveller has found the position of the pole, he measures its altitude by a method similar to that shown in Fig. 21. Whatever the altitude he measures is his latitude south of the equator (Fig. 21.)

SUMMARY.

Sailors use charts which show accurately the latitude and longitude of the places to which they are voyaging.

Out on the open sea, sailors determine the position of the ship at



FIG. 22.—MAPPING NEWLY SURVEYED LAND.

noon daily by observing the position of the sun—or the Pole—and by calculating from their observations the latitude and longitude.

Accurate maps depend upon the care with which many hundreds of different observers have determined the latitude and longitude of many places.

EXERCISES.

1. On March 21st and September 22nd the sun is exactly overhead at noon at the equator. A captain, on March 21st, finds that the altitude of the sun is 40° when it is highest in the sky. At that moment the ship's chronometer records 3 p.m. at Greenwich. Where is he?

(a) Because noon at his place is three hours later than noon at Greenwich, his longitude is 45° W.

(b) Because the height of the sun is 40° his latitude is either 50° N. or 50° S.

2. On June 21st, the sun is overhead at noon at the tropic of Cancer (lat. $23\frac{1}{2}^\circ$ N.). A captain finds that the highest altitude of the sun on June 21st is 65° . What is his latitude?

Sun's distance from vertex = $90^\circ - 65^\circ = 25^\circ$.

Latitude of place = $25^\circ + 23\frac{1}{2}^\circ = 48\frac{1}{2}^\circ$ N.

3. On December 21st the sun is overhead at noon at the tropic of Capricorn (lat. $23\frac{1}{2}^\circ$ S.). A traveller observes the highest altitude of the sun on that day to be 40° . What is his latitude.

4. Explain how to find the Pole Star, and how you could determine your latitude from an observation. (*C.U.L.)

5. At a certain place on December 25 the sun attained its maximum altitude, which was 14° , at 12.50 p.m. Greenwich mean time. Find the latitude and longitude of the place. (*C.U.L.)

6. What is the latitude of a place north of the Equator at which, on June 22nd, the height of the sun is 60° above the horizon? What is its longitude if the time there is 1 p.m. when it is 11 a.m. at Greenwich?

(C.P.)

7. What is meant by a place having a 'high latitude'? What is the latitude and longitude of the antipodes of London? What country is near the antipodes; and when it is daytime and summer there, what are the conditions in London? (C.W.B.)

8. What is longitude? Draw a diagram to illustrate your answer. A place on the equator is in longitude 10° E.; give the latitude and longitude of its antipodes. (Cal. U.)

9. Describe clearly a method by which you could determine the latitude and longitude of the town in which you live. (Melb. U.)

6. Land Explorations and Maps.

1. Examine the map of Europe and Asia, sometimes called Eurasia in your atlas. Make a tracing to show the Mediterranean, Black, Baltic, and Caspian Seas, the Red Sea, and the Persian Gulf. Add the Nile, Don, Volga, Euphrates, and Tigris rivers to your map. Compare this map with Fig. 23, and write a brief note to show what parts of the two maps agree, and what parts disagree very greatly.



FIG. 23.—AN OLD MAP, 1351 A.D.

(Attempt to identify in this map the British Isles, the Caspian Sea, the Baltic Sea, the four great rivers of France, the Nile.)

2. Make a tracing of the outline of the continent of Europe from the map in your atlas. Compare this map with the map shown in Fig. 23, and shade your map to show those parts of Europe of which the shape was known fairly accurately in 1351 A.D.

Early land journeys.—The great travellers of the Middle Ages set out from countries which bordered the Mediterranean Sea, such as Italy, and journeyed by land eastwards to explore the country towards Cathay. One of the greatest of such travellers was **Marco Polo**.

Early maps.—Travellers like Marco Polo gave to the world

descriptions of the lands through which they journeyed: they described the seas which they skirted, the rivers they crossed, and the towns and villages through which they passed. They told also how many days' journey they made from one large town to another, and they described the routes frequented by travellers, traders, and the king's messengers in the lands through which they passed. From their descriptions, map makers who lived near the Mediterranean Sea made maps such as Fig. 23. They based the maps upon accounts of the sea coasts which were supplied by early seamen, and their maps tell us how much they knew about the world.

From Fig. 23 it is clear that the shorelands of the Mediterranean, Black and Caspian Seas were fairly well known. The positions of the Rivers Don and the Volga were known. The relative position of the Lower Nile and the Red Sea was known fairly well, as well as the fact that across Arabia lay the Persian Gulf, into which the two rivers of Mesopotamia flowed. In maps of this kind, the Mediterranean Sea was shown lying in the middle of the world; hence the name, which means middle of the land.

Later maps, such as Fig. 127 (p. 223), show how men's knowledge of Asia had improved, how men ceased to think of the Mediterranean as being the middle of the earth. Ceylon was known and the peninsula which ends at Singapore is shown fairly well, and in this map some attempt has been made to show the mountainous nature of the country to the east of the Caspian Sea across which travellers had to journey from Europe to Cathay.

Progress in map-making.—Very slowly travellers began to use the methods adopted by seamen to determine the latitude and longitude of the large towns, mountains, and rivers in the world.

Even in England, in a book printed about 100 years ago, a record is inserted of measurements to determine the latitude and longitude of a village in Staffordshire.

Accurate maps, such as are printed in a modern atlas, are the result of improvements in land measuring, or surveying, which have chiefly been made in the last fifty years. Even to-day, parts of America, Australia, New Zealand, etc., have not been properly mapped. Consequently, there is little need to pay attention to any but modern methods of mapping the land.

Plane-table mapping.—A **plane table** is a surveyor's instrument for making maps of small stretches of country. It consists of a

board which is made level by means of a spirit level, Fig. 24, and a sighting ruler.



FIG. 24.—A PLANE TABLE WITH SIGHTING RULER.

A plane table is used by the surveyor to reproduce on a sheet of paper a triangle which represents a triangle on the land. He selects a base line AB (Fig. 25). He sets up his plane table at A , sights the direction AB and draws a line along the edge of the



FIG. 25.—THE FIRST TRIANGLE OF A PLANE-TABLE SURVEY.

ruler; he then sights the windmill, C , and draws a line along the ruler to show the direction AC . He measures his base line on the land, say it is 5 miles, and marks on the paper a certain distance, say 5 inches, from A along AB : the end of the distance is B . (His work is thus done on a scale of 1 in. = 1 mile.) He removes the plane table to B , levels it, and then places his ruler along BA , and adjusts the table so that when he looks through the

sights he can see *A*. The table is then in position, and the ruler is moved until he sights the windmill. He next draws along the edge of the ruler the line to show the direction *BC*. Where this line cuts the line showing the direction *AC* is the position of *C*. If the distance on his paper *BC* is 6 inches, he knows without measuring the land that the windmill is 6 miles from *B*.

In map making, the surveyor makes one triangle for each point he observes, and thus he produces a series of triangles such as those shown in Fig. 22, which also shows the map worked up from the **triangulation** which was actually performed in Africa.



FIG. 26.—PLANE-TABLE SURVEYORS* AT WORK IN INDIA.

Plane-tabling in India.—Fig. 26 is a photograph of a survey party at work in India. The pile of stones has been erected as a convenient mark for sighting; the sighting ruler is held by one of the native surveyors, and the officer has field-glasses to assist him. Such survey parties performed the work on which the map of a portion of the Panjab (Fig. 133) is based.

On the east of the map a long ridge of highland is indicated, the Dhauli Range. At a gap in this ridge several streams from the west join their water to form a river, the Drug Láhar. The ridge slopes sharply on the west and less steeply on the east. The village of Drug lies almost in the middle of a stretch of flattish lowland about 3000 feet above sea level. North of Drug the stream Láng

Nála has several branches which make one large island over a mile in length and two small islets.

Like the streams, the camel-roads and the mule-paths unite before the road passes the gap in the Dhauli Range, which is not crossed by paths or roads.

Plane-tabling in the United States.—Parts of the maps of the United States have been based on plane-table triangulation. Fig. 27 is a photograph of a survey party of U.S.A. Government officers.



FIG. 27.—PLANE-TABLE SURVEYORS AT WORK IN THE UNITED STATES.

The sighting apparatus in this case consists of a small telescope mounted on a ruler; by this means maps of large areas may be obtained. Both in India and the United States plane-table surveys are carried out because they are quicker than other methods, and because otherwise large portions of the country would have to be left unmapped.

The usefulness of plane-tabling.—Many explorers make plane-table surveys of new lands for the benefit of those who follow them. Dr. Sven Hedin was one of the first to make accurate plane-table surveys of **Tibet**. A later explorer, Dr. Stein, wished to visit a ruin marked on Dr. Hedin's maps. Between him and the ruin lay the desert. He relied upon the map, steered a course across the desert and found the ruin. If Dr. Hedin's map had been inaccurate Dr. Stein would have perished in the desert.

More accurate map-making.—One great advantage of plane-

table map making lies in its speed ; for the map is made without the necessity of many toilsome calculations. In mapping old countries, such as England, more careful work is required, and more accurate instruments than the plane table are needed.

Modern surveyors use an instrument called a **theodolite** (Fig. 28). They start from a base line just as in the case of the plane-table.



Photo E. H. Gregory

FIG. 28.—A THEODOLITE.

(At work on the Sussex Downs.)

They measure, from each end of the base line, the angles made by lines of sight to various prominent objects, and then, at home, they construct a series of triangles, such as those of Fig. 22, from the measurements which they have made. When they have proceeded so far, they measure other angles from place *C* and from place *D* to other prominent objects, using *CD* as a new base line, and so they build up by means of a series of triangles a map of the country. From many small maps of parts of the country, the maps of larger

areas are constructed. These are the principles on which the Ordnance Survey has made maps of the British Isles.

A specimen of part of an Ordnance Survey map is shown in Fig. 39, p. 51.

Contour maps.—When the surveyor is measuring his angles, he takes note also of the angles of elevation above a horizontal line which each line of sight makes. From these angles he calculates, by methods which are too elaborate to explain here, the heights of hill-tops, etc., above the level of his base line. By this means he can insert upon his map the heights of the land.

In a new country like New Zealand, the surveyors have not had time to conduct a theodolite survey of the whole country. In Westland, South Island, gold was discovered, and the surveyors recently made a theodolite survey of the northern part of Westland, for the particular purpose of showing where the gold ores occurred. On their maps the surveyors indicated the courses of the rivers and some of the heights of the hills and mountains with great accuracy. When they had done this, their geographical work ceased, and they turned their attention to the rocks in connection with their search for gold ores. Geographers, however, may make use of their work. Fig. 29 shows a geographical map which has been made in England from the printed maps made in New Zealand.

The contours which are shown in Fig. 29 were made by a map-maker who had never been to New Zealand, from the heights recorded upon the surveyor's maps. People who have been to this part of New Zealand say that Fig. 29 shows the relief of North Westland with a fair degree of accuracy.

Contour maps vary in accuracy from maps such as Fig. 29 to the more exact maps of the Ordnance Survey. In all cases, parts of the contour lines, *i.e.* lines which show the heights of the land above the level of the sea, are inserted in the map by the map maker. Usually they are made by joining together a number of places of which the height has been accurately determined by means of the theodolite. The accuracy of the contour lines depends upon the closeness with which these places occur to each other.

SUMMARY.

Coast-line maps are made as soon as the latitude and longitude of places along the coast are known.

Inland maps are made by triangulation from a base line: the



B. C. Wallis inv.

Emery Walker sc.

FIG. 29.—PART OF SOUTH ISLAND, NEW ZEALAND.

(Note the snow fields and glaciers of the Southern Alps, the numerous rivers, and the horse-shoe shape of the upper valleys. The numerous streams on the coastal lowland remind us that this district is one of the rainiest regions in the world.)

latitude and longitude of the two ends of the base line are accurately determined.

Contour maps show the highlands and the lowlands, the steep slopes and the gentle slopes, the valleys and the ridges.

EXERCISES.

1. Fig. 30 shows a map of the sea round an islet in the Channel Islands. The numbers refer to the depths of the sea in feet. Trace the outline of the



FIG. 30.—PART OF AN ADMIRALTY CHART: THE CHANNEL ISLANDS.

coast and mark with red dots all the places where the sea is 40 ft. deep and join the dots with a red line so that no place deeper than 40 ft. lies between the red line and the coast. This is the 40 ft. contour line. Make a 50 ft. contour line similarly with blue dots, etc.

2. Draw a map to represent the land shown in Fig. 31. Represent the hills by contour lines. Write numbers on the map to represent the physical

features, and make a list of the numbers with the names of these physical features at the side of the map. (C. U. L.)

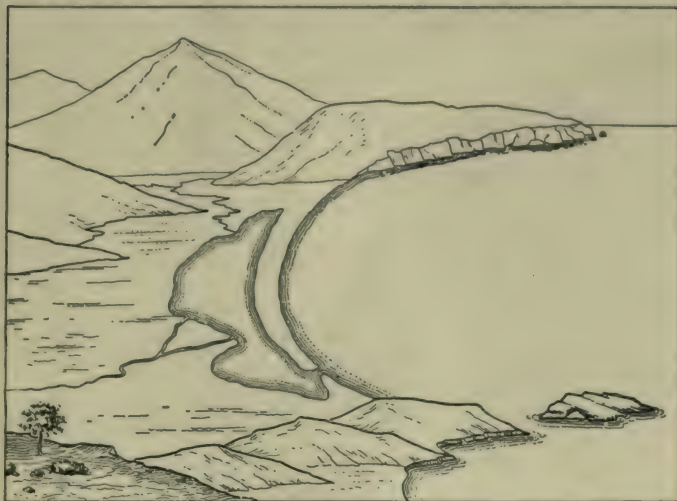


FIG. 31.

Emery Walker sc

7. Contour Maps.

1. Draw sections from X to B and X to C and determine whether B and C are visible or invisible from X (Fig. 32). Read the first paragraph below before you attempt this work.

2. Make separate tracings of the 100, 200 and 400 feet contour lines of Fig. 34. Paste each tracing separately upon a piece of thin cardboard and cut out with a fret-saw or with scissors the outline of the tracing. Fasten the pieces of cardboard separately upon a thin block of wood cut the size of Fig. 34 to make a model of the district. With plasticine or a mixture of thin plaster of paris fill in the steps of the model to show the land surface. This surface may, when dry, be coated with white enamel paint and then the rivers may be painted in. Use the model in reading p. 45. Insert the towns, roads and railways from Fig. 35.

Contour lines and sections.—Examine Fig. 32. It is required to draw a line to show the slopes of the land along the line SS . Dotted lines are drawn at right angles to the line SS to meet the

appropriate line in the numbered scale below the diagram. It is estimated that the heights of the ends of the line *SS* are just above 2000 ft. and below 500 ft. respectively.

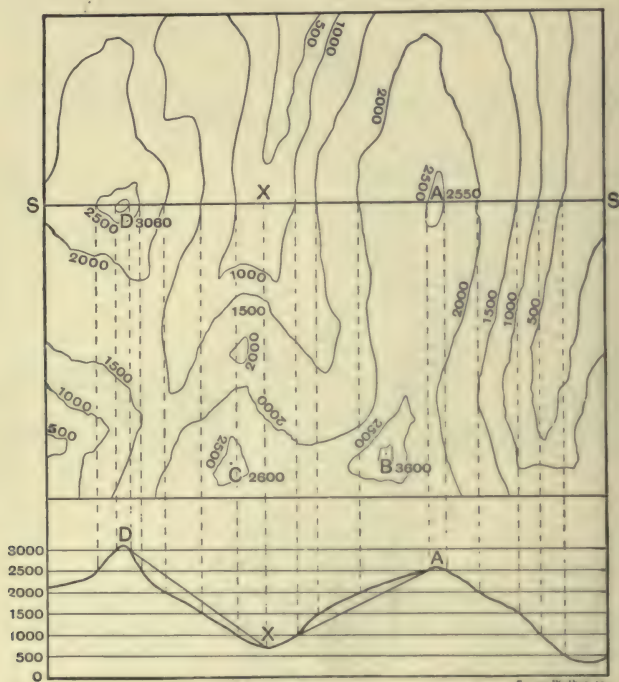


FIG 32.

Emory Walker sc.

When the dotted lines have all been drawn, their ends are joined to make the wavy line below the map. This wavy line shows that from *S* to *D* is uphill, from *D* to *X* downhill, from *X* to *A* uphill and from *A* to *S* downhill. It further shows that the slope from *A* to *S* is in parts the steepest slope of all; this fact is indicated in the map by the closeness of the contour lines between *A* and *S*. Such a wavy line is called a **section**. (Fig. 32.)

When a section has been drawn it is essential to calculate the **vertical exaggeration**.

Suppose the map (Fig. 32) is on a horizontal scale of $1'' = 2$ miles,

the vertical scale of the section is $1'' = 5000$ feet. The calculation is then made as follows :

$$\begin{array}{lcl} \text{horizontally } 1'' \text{ represents } (2 \times 5280) & 10560 & \text{feet.} \\ \text{vertically } 1'' & & 5000 \text{ ,,} \\ \therefore \text{vertical exaggeration} = \frac{10560}{5000} & = 2.1 & \text{approximately.} \end{array}$$

This result means that all the slopes in the section appear to be twice as steep as they are in reality.

Sections are useful to engineers who have to plan railway lines, and to motorists and cyclists. The latter frequently use a "road book" which shows sections or "profiles" of the main roads of England and Wales. Fig. 33 is a specimen of such a profile. Sections are also useful to determine whether a particular spot on the country side is visible or invisible from a second place. For

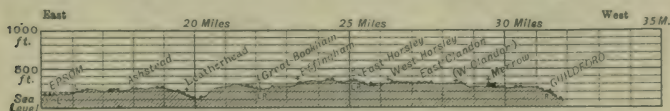


FIG. 33.—THE ROAD ACROSS THE SLOPE OF THE NORTH DOWNS FROM EPSOM TO GUILDFORD.

(The miles represent distances from London. Note the drop to Leatherhead at the entrance to the Mole Gap and to Guildford at the Wey Gap.)

example, in Fig. 32 straight lines are drawn in the section from X to A and X to D . The line XA passes below the ground surface ; therefore A is invisible from X and X is hidden from A . Similarly X and D are visible from each other.

Contours ; valleys ; gaps.—Fig. 34 shows the contours from part of the North Downs in the neighbourhood of Guildford and Dorking (G and D , Fig. 34). The long narrow ledge of land higher than 400 feet to the west of Guildford is the Hog's Back (HB). The town of Guildford is situated in a gap in the hills through which the river Wey flows northwards to join the Thames. Dorking is situated at the southern end of a similar long gap through which the river Mole flows to join the Thames past Leatherhead, which marks the northern end of the Dorking Gap.

The roads, railways and towns of the district are shown in Fig. 35. Most of the roads and railway lines keep to the lowland and the river valleys. Horsham in the south-east is an important junction where roads and railways meet. One of the main roads from London to Portsmouth and Southampton passes through Epsom, Leatherhead, Guildford and Godalming. The portion of this road

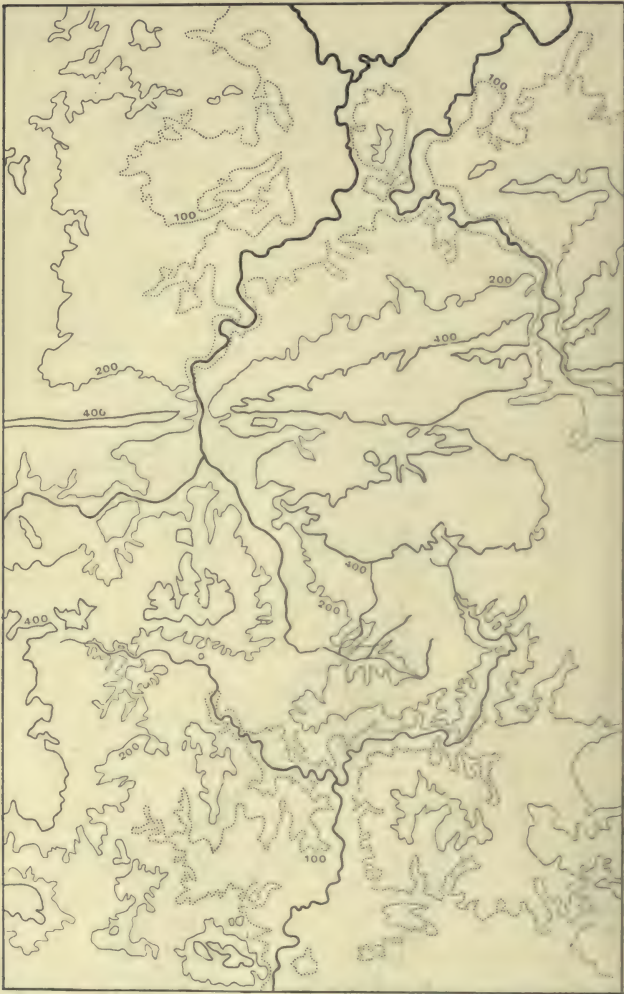


FIG. 34.—THE DORKING AND GUILDFORD GAPS IN THE NORTH DOWNS.

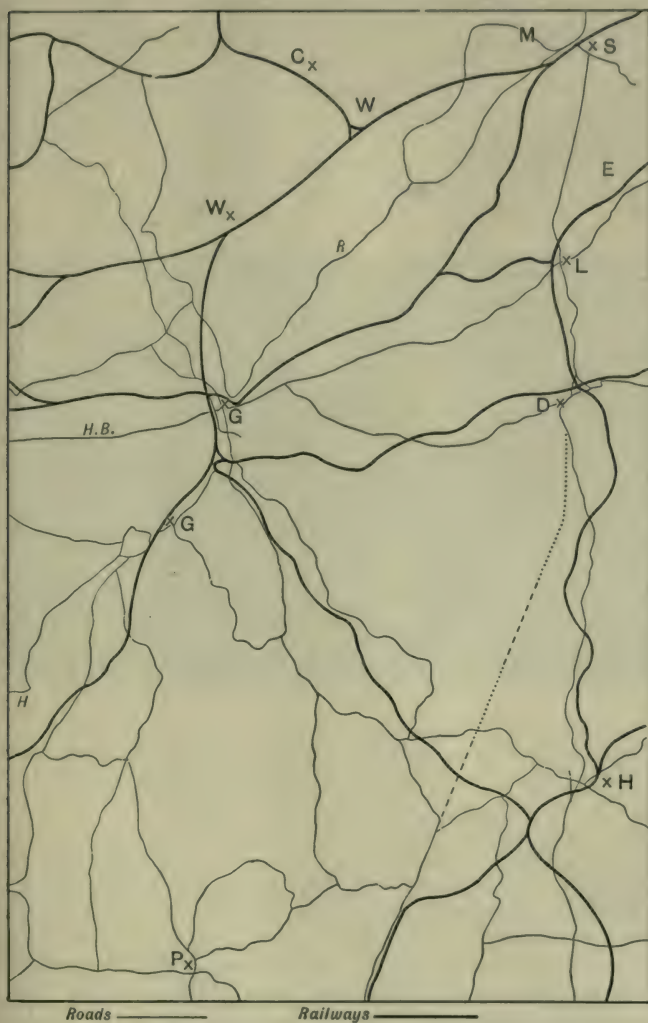


FIG. 35.—ROADS AND RAILWAYS IN RELATION TO THE GAPS.

from Epsom to Guildford is shown by the profile from a road book (Fig. 33). The drop where the road crosses the valley of the Mole is distinctly marked at Leatherhead. The dotted line to the south-west of Dorking shows the direction of an old Roman road; along which the Roman soldiers tramped on a march from Chichester, near the South Coast, through the Dorking Gap to London, which they entered at Billingsgate: this road was called Stane Street.

The contour lines in Fig. 34 are noticeable for the V-shapes which they make at the places where they cross the rivers. These



Photo Valentine & Sons

FIG. 36.—THE NANT FFRANCON VALLEY, NORTH WALES.

V-shapes are like arrow heads pointing up stream. Such V-shapes pointing up-stream always indicate **valleys**. If a model of the land shown in Fig. 34 were made in plasticine or modelling clay it would be possible to make a mould in Plaster of Paris from which many other relief models of the district could be cast. By comparing the relief of the original model with the mould it would be found that everything was reversed: the Hog's Back would be a trench or valley: the valleys of the Wey and Mole would appear as ridges: the gaps would appear as hills. The V-shapes in the contours, which marked valleys on the model and signify valleys on the land, because they point up-hill, would point down-hill in the mould; consequently V-shapes which point down-hill indicate ridges: Fig. 33 shows the ridge pointing towards Guildford from the east.

The ridges which point towards Dorking (Fig. 34) stretch downwards from two of the best-known hilltops in the North Downs, Box Hill on the east side and Leith Hill on the south-west side of Dorking.

Photographs and contour maps.—Fig. 36 is a photograph of the valley of a little stream—the Ogwen—in North Wales. The valley

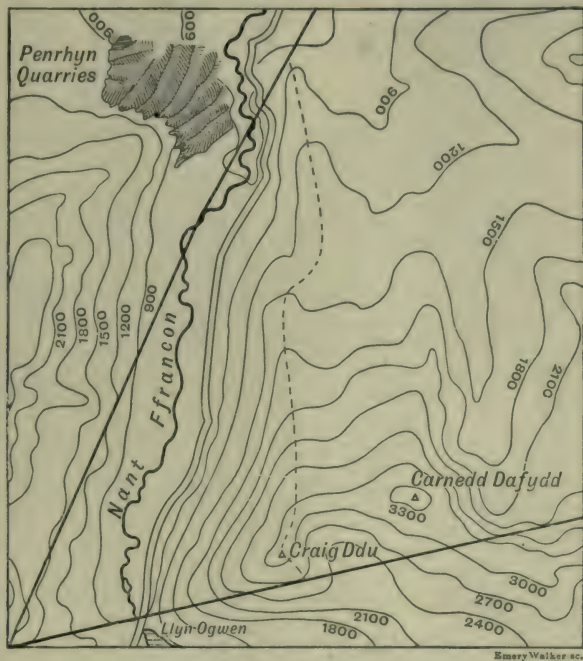


FIG. 37.—THE NANT FFRANCON VALLEY.

is known as Nant Ffrancon, "the valley of the beavers." The picture shows the flat bottom of this valley gently sloping downwards to the left. Beyond the stream is a steep slope to the top of a hill, Craig Ddu. Along the slope, raised above the valley bottom, which is flooded and marshy, is a road. In the old coaching days this road was used by travellers who were journeying from London to Holyhead to take ship to Ireland. Just outside the picture, on the left, the road enters Bethesda village. Fig. 37 shows the contours for

W.J.G.

D

this district. The camera was placed in the corner, the black lines mark the edges of the photograph, and the dotted line shows the sky line of the photograph. Fig. 37 shows that a ridge of land stretches from a hill, Carnedd Dafydd, towards the south west, and that at the end of this ridge the hill top Craig Ddu rises to a lower elevation than Carnedd Dafydd. Craig Ddu hides Carnedd Dafydd, although it is about 400 feet lower in height (Fig. 37).

The closeness of the contour lines (Fig. 37) on the west side of Craig Ddu indicates the steep slope seen in Fig. 36.

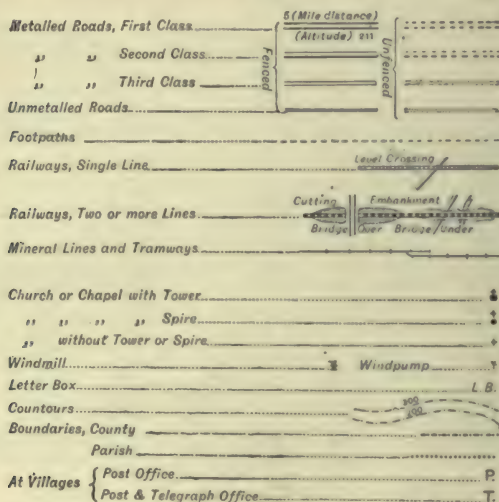


FIG. 38.—THE SYMBOLS USED ON AN ORDNANCE SURVEY MAP.

The 900 feet contour line (Fig. 37) runs almost parallel to the Ogwen River on both sides of it, and crosses this river with a blunt V-shape pointing up-hill. This indicates the flat nature of the valley bottom, which is also indicated by the windings of the river shown in the photograph.

Ordnance Survey maps.—Ordnance maps contain more information than is conveyed by simple contour maps such as Fig. 37. By means of the symbols which are indicated in Fig. 38 much more may be learnt about a district from Fig. 39 than from Fig. 37.

Fig. 39 shows the shape of Snowdon, the highest peak in England and Wales, and is a reproduction of a portion of an Ordnance



FIG. 39.—SNOWDON AND NANT GWYNANT.

Survey map. The **contour lines** indicate that the valley bottom which stretches from Beddgelert north-eastwards is below 200 feet above sea level, and that many ridges and peaks are higher than 3000 feet.

The **hachures** indicate the steepness of the slopes; they are drawn across the contour lines. Flat land, therefore, appears white and steep slopes appear very dark.

Fig. 39 is a beautiful specimen of the map-maker's art, the ridges show so clearly.

The district shown in Fig. 39 lies to the west of the Nant Ffrancon Valley (Fig. 37), and includes bare rocky hills such as Craig Ddu (Fig. 36).

EXERCISES.

1. The scale of the accompanying map is 1 inch = $2\frac{1}{2}$ miles (Fig. 40).

(a) Measure the distance from Swanage Station to Wareham Station (1) in a direct line; (2) by the main road through Langton Matravers; (3) by rail.

(b) Estimate the area of Branksea Island (in the north of the map).

(c) Describe the view looking eastwards from the point *A*, which lies to the south of Kingston at a height of 434 feet.

(d) Describe the situation of Corfe Castle.

(e) Draw a section along the line *BC*. (Sc. Ed. Dept.)

[*N.B.*—Before answering these questions: (i) Make a tracing of this map to show only the 200, 400 and 600 feet contours: colour the land higher than 600 feet brown, that between 400 and 600 feet a pale brown, that between 200 and 400 feet yellow. This will show up the hills and the gap in which Corfe Castle stands.

(ii) Draw a rough section from *A* to Swanage and from *A* to *C*. From these sections you can determine whether Swanage is visible from *A* and whether any of the shoreland of Studland Bay can be seen beyond the hill tops.]

2. Draw small sketch maps of the following and indicate the relief by contour lines for every 100 feet: (a) a volcanic cone, the base of which is at an altitude of 1000 feet and the crater at the top 600 feet higher; (b) an estuary surrounded by cliffs rising to over 500 feet on all sides and containing two rocky islands, one rising to 150 feet and the other to 250 feet. (C.S.C.)

3. A river is 100 miles long if its windings are followed. From source to mouth the direct distance is 50 miles. The river runs for 30 miles over a plateau 2000 feet high, falls rapidly for 10 miles to the level of 1000 feet, descends more rapidly to the plain which commences at 100 feet and from that point winds considerably till it reaches the sea.

Draw a sketch map, showing by contour lines the course of the river. Show the scale by dividing your paper into areas of 100 sq. miles. (L.C.C.)

4. Explain what is meant by **contour lines**.

A lake lies 1000 feet above sea level, and is surrounded by highlands rising steeply from its shores to a height of 1300 feet above sea level, but sloping on all sides down to the sea 50 miles off. Draw a sketch map and show this by means of contour lines. (C.P.)

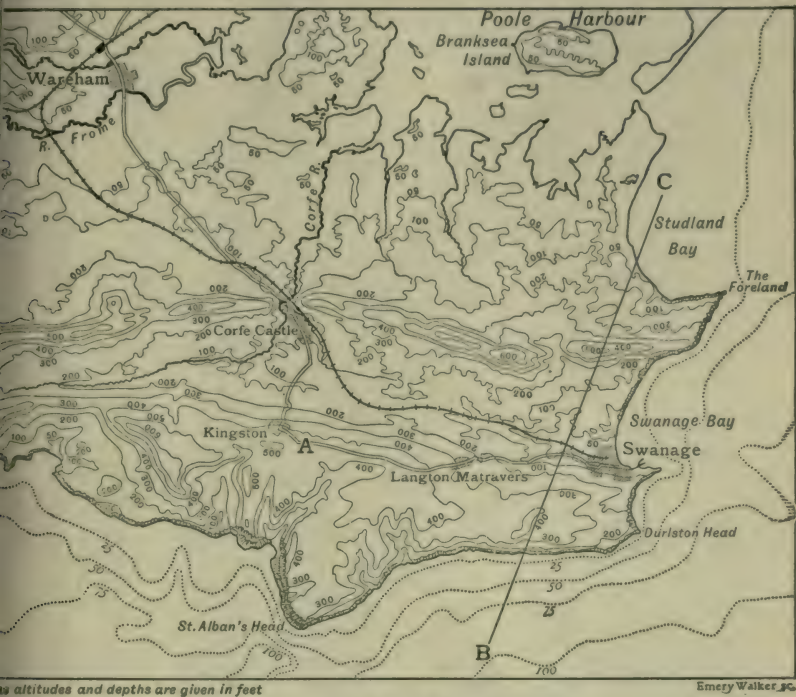


FIG. 40.—A MAP OF THE SWANAGE DISTRICT.

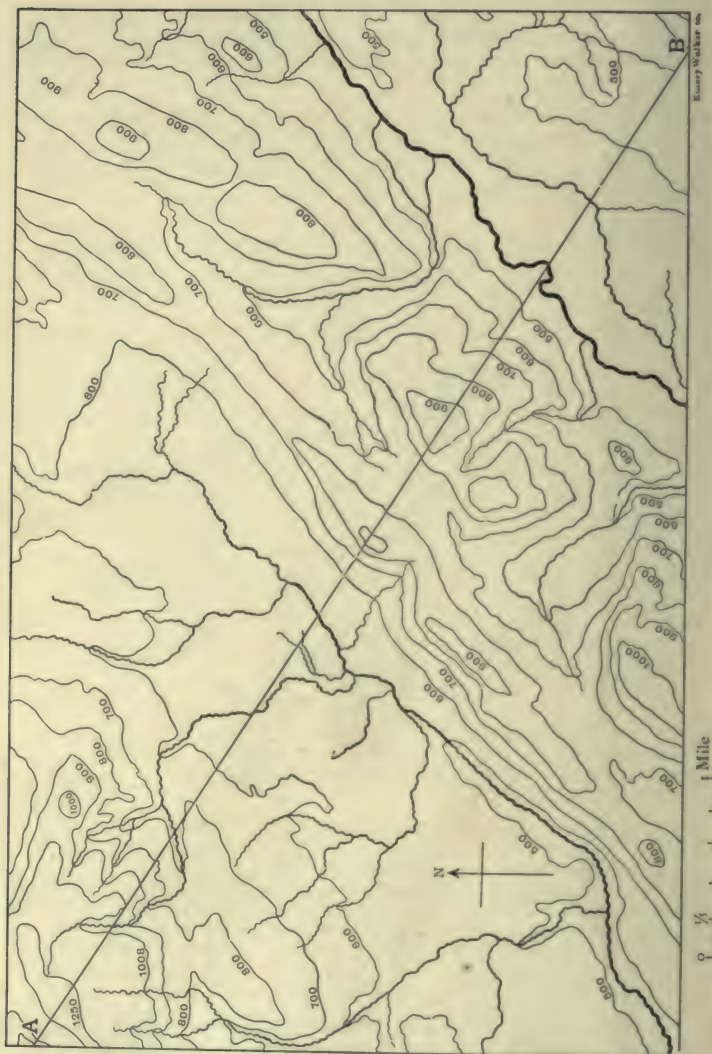
5. Explain the use of contour lines on a map.

Draw a contoured map of a ridge 2 miles long and $\frac{1}{2}$ mile broad, running east and west. The top of the hill is a plateau 400 feet high, 1 mile long and $\frac{1}{2}$ mile across, and the descent is steeper on the south side than the north. Draw the map to a scale of 4 inch to the mile and show contour lines for every 100 feet. (C.S.C.)

[Examine the ridge in Fig. 37.]

6. Represent the following on a map, using contour lines :

A valley running more or less north and south, with hills on the west rising to 800 feet and to the east to 600 feet. A stream flows along the



valley, entering at a height of 500 feet and leaving at 200 ft. There is a small side valley on the east, partly filled by a mountain lake. There is also a railway in the lower half of the valley with a walled-in road which is an open moor road in the upper half of the valley. (C. P.)
[Consider first Fig. 38.]

TEST PAPER.

1. Describe a simple plane table or any other simple apparatus or instrument you could use together with a surveyor's chain to make a rough plan of your school ground and its neighbourhood. (N.Z. Ed. Dept.)

2. Show by sketches how a valley, a conical peak, and a sharp declivity are indicated on a contour map. Draw to suitable scales the outline of an irregularly shaped mountain 14 miles long at its base and 8000 feet high and show how it would be indicated on a contour map. (N.Z. Ed. Dept.)

3. Describe the district shown on the map (Fig. 41). Make a section along the line *AB*; taking 1 inch to represent 1000 feet vertically. Calculate the vertical exaggeration of the section. (*C.W.B.)

4. What do you understand by the following terms: latitude, longitude, contour line, triangulation, altitude of the sun?

8. Climate.

1. Make a list to show the direction of the wind daily for a month. Note on each day whether the wind blows gently or strongly, whether the sky is clear or cloudy, and whether the weather is fine or dull, and whether it rains or is dry.

2. Keep a record for as long a period as possible of the kind of weather which occurs when the air is calm. If you start keeping such a record during the summer, be sure to keep a similar record during the winter. Make careful notes of the differences between summer and winter results.

3. Keep a special record of the days of stormy weather. Note the wind direction at the beginning of the storm, and note any change of wind direction during the ensuing period. Do this exercise sufficiently often to discover whether the wind behaves in the same way during all stormy periods.

The atmosphere.—The earth is surrounded by an envelope of air, called the atmosphere, which reaches to a height of perhaps 200 miles above the surface, though at this height it is in an extremely rarefied condition. Above a height of about eight miles, human life is impossible on account of the rarity of the air.

A glass of cold water brought into a warm room becomes coated with drops of moisture: this shows that the atmosphere contains in it some moisture which cannot be seen in ordinary circumstances,

but can be condensed upon very cold substances. If the cold substance be carefully warmed, the moisture disappears again. From this and similar experiments it has been ascertained that the atmosphere in England always contains some moisture, that this moisture becomes visible when the atmosphere is chilled, and that the visible moisture may disappear again if the air be warmed.

The steam cloud, or visible moisture, which issues from the funnel of a railway engine, becomes visible because it is chilled by the colder air which surrounds it as it comes out of the funnel ; but a short distance from the funnel the visible moisture disappears again, since the air some distance from the funnel does not exert so great a chilling effect.

Similar facts are to be observed on the country side early in the morning. Before the sunshine has warmed the air very much, mist or visible moisture lies in the valleys, and obscures them from sight. As the day proceeds the air is warmed by the sunshine and the mist disappears.

The atmosphere contains moisture. This moisture may become visible as **mist**, or **fog**, or **cloud**, whenever the air at that place is chilled. If the air be chilled further the moisture may fall as rain. The atmosphere is capable of containing more invisible moisture if it becomes warmer.

Sunshine.—The sun is highest in the sky at noon ; and it is found that during the middle of the day the warmth which the earth receives from the sun is greater than at any other time. As a general rule, it may be said that the higher the sun the greater is the temperature. The noonday sun in summer is higher than that of winter ; consequently, the sun exerts a more powerful warming influence during the summer than during the winter.

Hills and mountains.—In mountainous countries, such as Switzerland, it is possible to see brilliant sunshine lighting up the snow and ice which cover the mountain tops (Fig. 42). Consequently, even at midday, when the sun is most powerful, the air at high elevations is sufficiently cold for water to remain frozen. In hilly districts it frequently happens that the tops of the hills are wreathed in clouds (Fig. 42), and the traveller who climbs those hills discovers that he may go into the clouds to find that it is either very foggy or is raining gently. At the foot of the hills and in the valleys at the same time it is not raining. It may be concluded therefore that the atmosphere is colder near the tops of hills and mountains than it is in the valleys below : and that this coldness may sometimes be

sufficiently great to chill the air and make the moisture in it become visible.

Winds from the sea.—The atmosphere over the surface of the sea is usually moist, *i.e.* it contains a large amount of invisible vapour. When the atmosphere moves towards the land, *i.e.* when a wind blows from the sea, this wet air passes over the land surface. In its passage over the land the air may become warmer or become colder; if it gets warmer there is no rain, but, if the atmosphere gets colder, the moisture becomes visible and it usually rains upon the land.

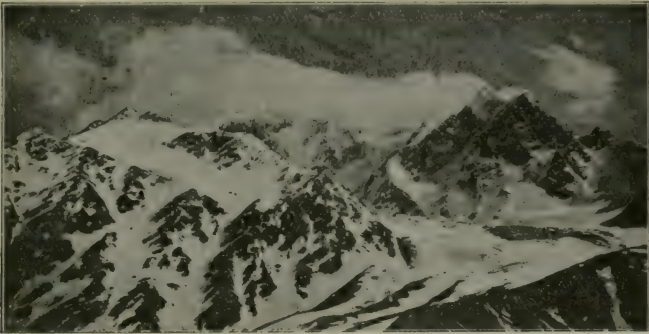


Photo G. T. Parratt

FIG. 42.—SNOW-CLAD, CLOUD-CAPPED MOUNTAIN TOPS.

In cases where the atmosphere gets warmed during its passage over the land, it may happen that a little distance from the sea the land rises into hills or mountains, and the air is forced to rise as it moves forward; consequently, the air now becomes colder and it rains on the slopes of the hills.

Winds from the sea may bring rain in two ways. First, if the land is colder than the sea, it may rain at once, and the whole coast land receives rain. Secondly, the air may not become chilled until it rises up the slopes of hills or mountains, so that the rainfall is limited to the upland areas.

Winds from the sea, sometimes called on-shore winds, therefore, bring some rain as a rule to the land near the sea, and they bring more rain to the uplands than to the lowlands.

The winds of the world.—Until the last century sailors were dependent upon the winds, and therefore men have learnt a great deal about the winds which blow over the oceans. This knowledge

is summarised upon the map (Fig. 43) which shows the directions of the wind. In the neighbourhood of the tropics there are areas where usually no wind blows ; between such a region of calms and the equator there are the **Trade Winds**, which blow in a cross direction equator-wards, so that the winds in the Northern Hemisphere are the **North-east Trade Winds** and those in the Southern Hemisphere are the **South-east Trade Winds**.

Winds also blow in an oblique direction from the region of calms polewards ; but in this case the direction is not so constant as in the case of the trade winds. In the Northern Hemisphere : in the North Atlantic, and in the North Pacific Oceans, the winds blow usually from the south-west or from the west ; and in the Southern Hemisphere the winds blow from the west or the north-west. The winds of the north are called the **Westerlies**, and those of the south are called the **Brave West Winds**. Sometimes the latter winds are called the **Roaring Forties**, because they blow in latitudes which are from 40° to 50° South.

Only in the neighbourhood of South-east Asia do the winds reverse their direction during the year. Over the Indian Ocean and the neighbouring parts of the Pacific Ocean the wind blows towards Asia during the summer and away from Asia during the winter : these winds are called **Monsoons** ; the summer monsoon is an on-shore wind, and the winter monsoon is an off-shore wind.

Use of the winds to the sailor.—Sailing ships can only travel when the wind is favourable, *i.e.* when it blows into the sails. Steam-ships sometimes find that it is difficult to proceed on the voyage against a strong head wind ; and some steam-ships use sails to help them on their journey. Sailors therefore try to plan their voyages so that the winds may help them along. Many captains of ships make use of a steady wind blowing in one direction.

On the voyage during which he discovered America, Columbus travelled before the north-east trade wind. In the days of sailing-ships most ships went to Australia and New Zealand from Europe down the Atlantic Ocean, round the Cape of Good Hope, across the Southern Pacific before the brave west winds, and homewards in the same direction round Cape Horn and up the Atlantic Ocean ; the direction of such voyages is marked upon Fig. 43. Even at the present time sailing vessels from South Africa to India take a different route when the summer monsoon is blowing from the route they take during the winter, and in the old days sailing ships planned to reach India during the summer, and to start



FIG. 43.—PERMANENT WINDS IN RELATION TO ANNUAL RAINFALL.
 (Note the rain which occurs where winds blow on-shore.)

their homeward voyage to Europe when the winter monsoon began to blow.

Use of the winds to landmen.—The chief way in which the winds help the landsman directly is by turning windmills. In many countries windmills are still used to turn machinery for grinding corn, or for working pumping machines to raise water from wells. In some cases windmills are used to turn machinery for making electricity.

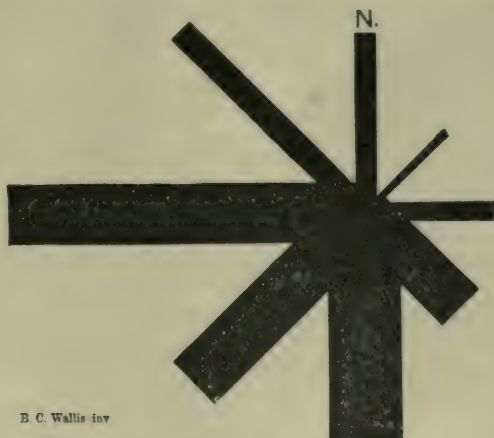
But this use of the wind is very limited in comparison with the benefit which the landsman obtains from the rains which the winds bring when they blow on-shore. The map (Fig. 43) shows the rainfall which occurs where the wind is on-shore in comparison with the absence of rain where the wind is off-shore. Western Europe, Western Canada, Western New Zealand, and Western South America receive on-shore winds from the west, and have an abundant rainfall and receive more rain than the lands on the eastern sides of the same land masses. Nearer the equator, because the winds are, as a rule, "easterlies," the eastern sides of the continents are wet and the western sides are dry.

The great **deserts** of the world near the equator are named in Fig. 43, and the map shows that the Sahara, Atacama, Kalahari and Central Australian deserts reach the sea-coast on the western sides where the winds are off-shore. These lands are desert because they receive no rain.

The winds thus determine what lands man shall occupy and till. Hence, unless the landsman finds some other occupation in these dry regions, he cannot live there; in Chile, near the Atacama desert, people live because they find a mineral, Nitrate, which they sell to the farmers of the rest of the world to use as manure for their fields. In Australia, men inhabit part of the desert because they mine gold. In both these places men must obtain good wages for their work, since they have to pay heavily for their water supply; for example, in Australia water is brought many miles in pipes across the desert.

The representation of winds.—The steady winds which blow over the ocean are represented on maps by arrows such as are used in Fig. 43, but over the land the wind does not steadily blow along the same main direction, so that the facts regarding the wind direction at any place have to be shown by wind roses such as Fig. 44. This wind rose shows that the chief winds to reach Giggleswick are from the west, south or south-west, and that few

winds blow from the east or north-east. The width of the lines indicates also that the winds which give most rain when they blow are those from the south, south-west, south-east and west.



B. C. Wallis inv

FIG. 44.—A WIND AND RAIN ROSE. Giggleswick. (Annual.)

(This diagram shows by the length of the black bands the proportion of the winds which blow from the direction of the land; *i.e.* most winds blow from the west. The width of the band indicates the wetness of the wind; *i.e.* a day's wind from the south brings more rain than a day's wind from any other quarter. The area of the black band indicates the total quantity of rain which comes in a year; *i.e.* least rain comes with a north-east wind, and most rain comes with a west wind.)

SUMMARY.

The air contains moisture. Clouds and fog are visible moisture. Moving air is called "wind." The trade winds blow always.

EXERCISES.

1. Sailing ships go from England to New Zealand by the Cape of Good Hope, but return from New Zealand to England by Cape Horn. What are the geographical reasons which account for this difference in the outward and homeward routes? (O.U.L.)

2. Draw a rough sketch map to show the general distribution of land and sea in the Southern Hemisphere. Show the belt in which the "roaring forties" are prevalent. Insert the parallel of 30° S. and the Antarctic circle. (O.U.L.)

9. Climate (*continued*).

1. Obtain a glass funnel, a glass measure marked in cubic inches, and a jam jar.

Place the jam jar, with the stem of the funnel dipping into it, in the open air, sufficiently removed from buildings and trees, so that rain falls freely on the funnel from all directions.

Measure the diameter of the top of the funnel, and calculate the area of the circular opening at the top of the funnel.

Calculate the thickness of a circular sheet of wood of the same area as the top of the funnel which would have a volume of 1 cubic inch. Then 1 cubic inch of water poured from the jam jar into the measuring jar indicates a rainfall of this thickness or depth.

Examine this home-made rain gauge at 8.30 a.m. daily, and record the rainfall of the preceding twenty-four hours as depth in inches or fractions of an inch.

Keep such a record for as long a period as possible.

2.* The table indicates proportional rainfall at various places. Indicate for each place whether it is in the Northern or in the Southern Hemisphere, and state whether its rainfall is constant, or winter or summer rainfall.

QUARTERLY PERCENTAGE RAINFALL.

Place.	January (D. J. F.)	April (M. A. M.)	July (J. J. A.)	October. (S. O. N.)
Melbourne - - -	23	26	23	28
Dunedin (N. Z.) - -	24	20	26	30
Alexandria - - -	62	13	—	25
Lahore - - - -	12	12	64	12
Tokio - - - -	12	25	31	32
San Francisco - - -	58	25	0	17

3.* The table below indicates proportional rainfall for various places which have summer rains. Make a graph to show the three kinds of summer rainfall which may occur.

QUARTERLY PERCENTAGE RAINFALL.

Place.	January.	April.	July.	October.
Pretoria - - - -	50	25	0	25
Bombay - - - -	0	1	80	19
Omsk - - - -	0	11	67	22

* These exercises should be worked after reading pp. 63-7.

4.* The table indicates proportional rainfall for places which have winter rains. Make a graph to show two kinds of winter rainfall.

QUARTERLY PERCENTAGE RAINFALL.

Place.	January.	April.	July.	October.
Cape Town - - -	11	26	45	18
Algiers - - -	43	27	3	27

5.* The table below indicates proportional rainfall for places which have constant rainfall. Make a graph to show the three kinds of constant rains.

QUARTERLY PERCENTAGE RAINFALL.

Place.	January.	April.	July.	October.
Colombo - - -	14	31	19	36
St. Louis - - -	19	27	32	22
London - - -	23	23	27	27

The measurement of rainfall.—At various places in the country rain gauges (Fig. 45) are set up in convenient spots where the rain from any point of the compass may fall into them. Each rain gauge is examined daily, the quantity of rain which has fallen into it during the last twenty-four hours is poured into a measuring glass which is so graduated as to indicate the thickness in inches of a circular slab of wood which would just cover the funnel of the rain gauge and yet be equal in volume to the water in the measuring glass. If the measuring glass records half an inch, then it is assumed that in the neighbourhood of the rain gauge if all the rain which had fallen during the preceding twenty-four hours lay on the surface of the ground there would be a depth of water of half an inch.

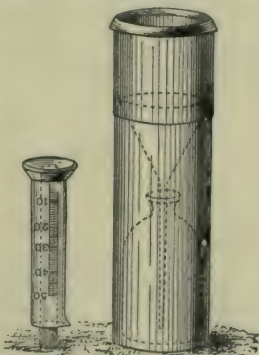


FIG. 45.—A RAIN GAUGE

* These exercises should be worked after reading pp. 63-7.

For most parts of the world it is important to know the total rainfall for the year, and the total quantities for each month. But the total quantity of rain which falls in any one year at a place may be twice as much as fell during another year: *e.g.* at Greenwich the lowest annual rainfall is 18 inches, and the highest 36 inches. Consequently, the rainfall is measured for a large number of years—for fifty years if possible—and the average rainfall for this period is then calculated and is called **the rainfall of the place**. For example, the rainfall at Greenwich is said to be 24 inches annually, and this means that the rainfall in any year at Greenwich will be about 24 inches, but may be as much as 36 inches or as little as 18 inches.

The representation of rainfall facts.—Suppose the numbers used by the map maker in making a contour map represented rainfall instead of heights above sea-level, then the map he made would be a **rainfall map** such as Fig. 43. When lines are drawn upon maps to indicate the places which have an equal average annual rainfall these lines are called annual **isohyets**.

It is important to know how the rainfall is distributed throughout the year, and for this purpose **rainfall graphs** are made to show the proportion of the annual rainfall which occurs during the four quarters of the year.

The rainfall in inches on the average per month during the year at Rio de Janeiro is as follows :

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
5	4	6	5	4	2	2	2	2	3	4	6

From this table the rainfall is calculated as follows :

For December, January, February	-	15 inches,	33 per cent
„ March, April, May	-	15 „	33 „
„ June, July, August	-	6 „	14 „
„ September, October, November	-	9 „	20 „
For the year	-	45 „	100 „

From the percentage column the graph Fig. 46 is made.

From the study of the rainfall for many places all over the world it is found that such rainfall graphs are of three kinds, shown in Fig. 47.

Type I. represents a rainfall which is fairly evenly distributed throughout the year.

Type II. shows that most of the rain falls during the period June to August, and that very little rain falls during the period December to February.

Type III. shows that the heavy rains occur from December to February, and that little rain falls from June to August.

Rainfall of type I. is called **constant rainfall**, or rainfall at all seasons. In some places January is the coldest month, so that places of this kind with rainfall of type II. have dry winters and wet summers, and places of this kind with rainfall of type III. have wet winters and dry summers.

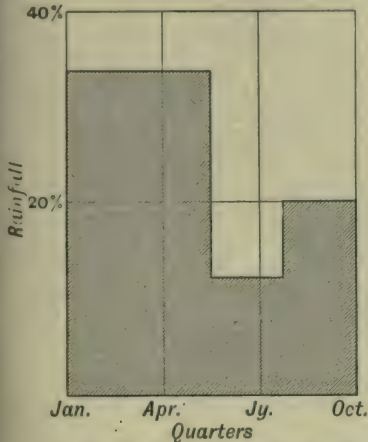


FIG. 46.—GRAPH SHOWING SUMMER RAINFALL AT RIO DE JANEIRO IN THE SOUTHERN HEMISPHERE.

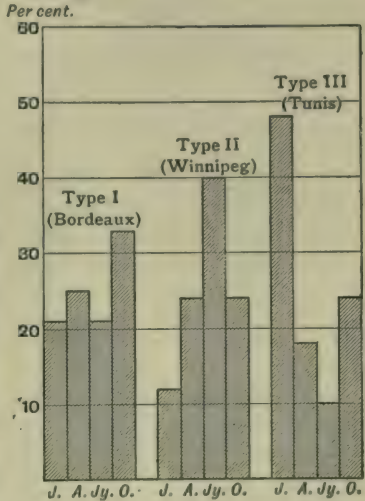


FIG. 47.—TYPICAL RAINFALL GRAPHS.

Type III. indicates summer rains for the places south of the equator when January is the hottest month, and winter rains for places in the Northern Hemisphere.

Constant rains.—Places which receive the constant trade winds or the constant westerlies have constant rains. Near the equator where the two trade winds blow constantly towards each other, lands which have on-shore winds are wet almost all the year round, and have a rainfall similar to that of Colombo.

Places in Western Canada, Western New Zealand, or in the British Isles have a rainfall similar to that of London.

It is possible to distinguish between the three kinds of constant rains only by noticing the quantity of the annual rainfall.

Places near the equator, like Colombo, have heavy rainfall, which is as a rule about 80 inches per annum (Fig. 43).

Lowland places in the Northern Hemisphere have a smaller rainfall, from about 20 inches to 50 inches annually.

Places in the Southern Hemisphere with constant rainfall have, if they are lowland places, from 30 to 60 inches annually.

Consequently, there are three kinds of constant rains, (i) near the equator, (ii) north of lat. 40° N. in the Northern Hemisphere, and (iii) south of lat. 40° S. in the Southern Hemisphere.

Summer rains.—There are three kinds of summer rainfall. In India and in other parts of South-eastern Asia, and in the North of Australia where the monsoon winds blow there is monsoon rainfall, such as that at Bombay. More than half the rain comes in the three summer months, and the three coldest months are almost quite dry.

In the interior of North America and of Eurasia it is exceedingly cold in winter. From November until April the air is so cold that there is a continuous frost, and during this frosty weather little or no rain falls, so that such places have very cold, dry winters, and have summer rains such as those at Omsk (p. 62).

The third kind of summer rains occurs on the edges of the trade wind areas shown in Fig. 43. Rhodesia may be taken as an example. In Rhodesia the sun is nearly overhead at noon during the period from December to February, and the weather is consequently very hot; consequently, the trade winds do not blow quite so far north during these months as they do during the remainder of the year, and the area within which the two trade winds meet lies almost entirely south of the equator. Consequently, the rainy region, which is due to the meeting of these winds, extends further south during these months than at other times: therefore, Rhodesia has rains during the hottest months, *i.e.* **summer rains**. Such rains are shown by the proportional numbers for Pretoria (p. 62), and occur in Rhodesia, in the Sudan and in Queensland.

It is possible to distinguish between the three kinds of summer rains by means of the shape of the graph and by means of the difference between the quantity of rain which falls annually.

Monsoon summer rains are as a rule heavy rains, so that the annual rainfall in monsoon countries may vary from 30 to 150 inches.

Summer rains in the cold winter regions are light, so that the annual rainfall is only about 20 inches, or less.

Summer rains in the trade wind areas may occur with an annual rainfall of from 10 to 30 inches.

Winter rains.—Winter rainfall is best illustrated in reference to the Mediterranean Sea. In this region the sun is lowest in the sky so that the weather is coolest during the months of December, January, and February. Consequently, during these months the **westerlies** from the Atlantic Ocean start nearer the equator, and some of these winds blow into the Mediterranean area. The shore lands of the Mediterranean Sea receive their rainfall from these winds and have winter rains. The annual rainfall varies considerably in amount, and largely depends upon the distance eastwards

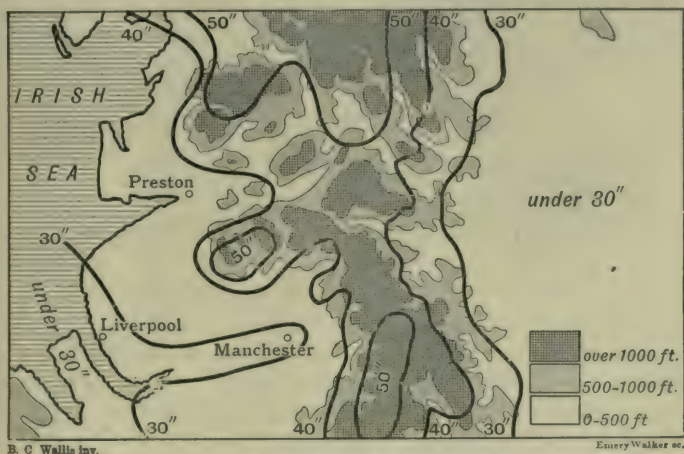


FIG. 48.—ANNUAL RAINFALL ON THE SOUTHERN PENNINES.
(Note the relation between rainfall and height.)

from the Atlantic Ocean at which the particular place is found. Mediterranean rainfall occurs at Algiers, and similar rainfall occurs in California.

The second kind of winter rainfall occurs during the months June, July, and August in the Southern Hemisphere, in Cape of Good Hope, South-west and South-east Australia, and in Chile. The various kinds of rainfall are summarised upon the map (Fig. 51).

Elevation and rainfall.—It has already been seen that elevated regions are wetter than their neighbouring valleys, so that a general agreement can frequently be noticed between the contour lines and the annual isohyets on a map of a small area such as Fig. 48. This map shows the relief of the Southern Pennines, and shows that,

roughly, land about 500 feet high on the west side of the Upland has a rainfall of 40 inches per annum, that land on the eastern side 500 feet high has 30 inches annually, and that land lower than these heights has a smaller annual rainfall.

These facts also indicate a second effect of elevation upon rainfall. The windy sides of hills—in this case the western slopes—are wetter than the lee sides: uplands tend to have less rain on their lee sides. This fact becomes clearer from a consideration of Fig. 49, which represents in profile a hill low enough for the winds to rise and pass over the top. As the wind rises it is chilled and drops its moisture; as it descends upon the lee side the air becomes warmer, and consequently there is less likelihood of any rainfall.

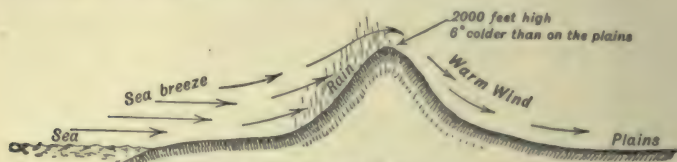


FIG. 49.—THE FÖHN EFFECT.

Rising winds grow colder. Falling winds grow warmer.

This fact may be noticed also in connection with the rainfall at Giggleswick, in the Pennine Upland. Fig. 50 shows that there are hills to the east-north-east of Giggleswick, and that valleys lead up to the place from the south-west and west and south-east, and a valley leads down to the place from the north.

Fig. 44 is a special form of wind rose which shows the direction in which the wind usually blows and the amount of rain which each wind brings. The length of the band of black indicates that the wind from this direction blows more frequently for the longer bands, and the width of the band of black indicates that the wider bands represent winds which are rainier than those shown by the narrow bands. From this figure it will be seen that the winds which reach Giggleswick by blowing up-hill are wetter than the wind from the north, which reaches Giggleswick by blowing down-hill, and that few winds reach Giggleswick over the hills which lie to the east, while such winds when they do blow are dry.

The warmth and dryness which occur in winds which are blowing down hill are termed the **Föhn effect**. In certain parts of the world this effect is specially noticeable in the late winter: the winds blow downhill among the Alps in Switzerland and on the eastern side of the

Rocky Mountains both in the United States and Canada. As these winds reach the lower land they cause the snow which covers these lands to melt very rapidly, and they absorb a considerable amount

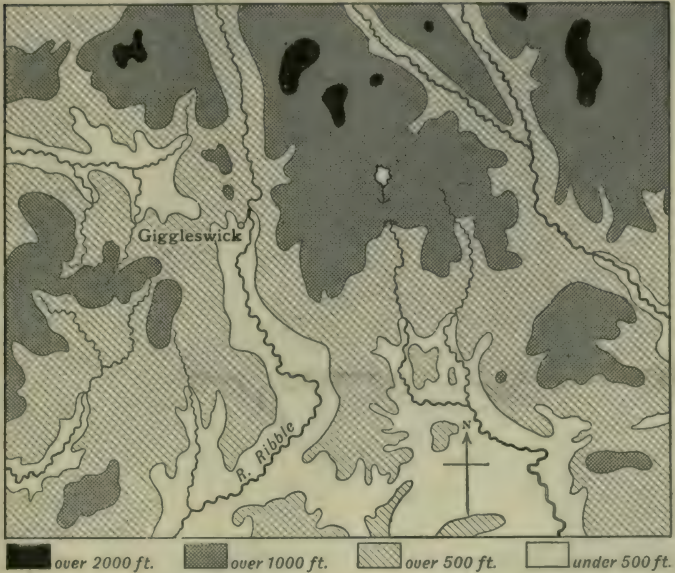


FIG. 50.—THE SITUATION OF GIGGLESWICK.

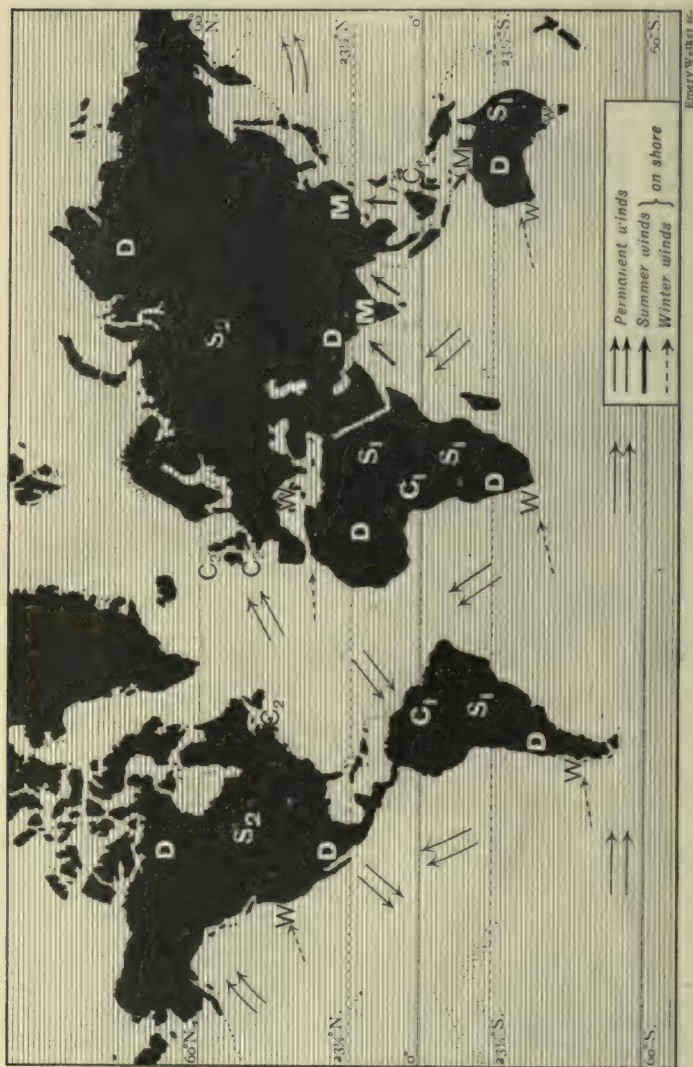
(The lowland to the south-east of Giggleswick is the Aire Gap. A north and south line down the middle of the map would mark part of the Pennine Water-parting.)

of the moisture thus produced. Such winds therefore make these lowlands more useful to man by clearing away the snow at an earlier date than the sunshine would do.

SUMMARY.

Rain falls when warm wet air is chilled. Air is usually chilled by rising up the slopes of hills and mountains. Some mountains are therefore snow-capped, others are frequently cloud-capped. The trade winds make east coasts rainy and west coasts dry.

The Westerlies make west coasts wet and east coasts dry.



Emery Walker &c.

FIG. 51.—SUMMARY OF RAINFALL AND WINDS.

C₁ = Constant rains with no seasons.
 S₂ = Summer rains with cool winters.
 M = Summer monsoon rains.
 D = Desert.

EXERCISES.

1. Explain fully why snow lies for a longer time on the higher portions of a mountain than on the surrounding country. (N.Z. Ed. Dept.)
2. Explain what is meant by trade winds, illustrating your answer by diagrams. (Man. Sch.)
3. What is meant by an inch of rain? Describe the construction and method of use of an instrument for measuring it. (*C.U.L.)
4. "In the trade wind belt dry regions are found towards the western sides of the land masses, while in higher latitudes they occur towards the east." Explain these facts and give the names of areas in support of your answer. (*O.U.L.)
5. What causes rain? How is rain measured? The average monthly rainfall at a certain place from January to December is given in inches, as 1.9, 1.5, 1.2, 1.5, 1.9, 2.3, 2.2, 2.3, 1.6, 2.3, 1.8, 2.1. Would you call this a wet place? Give reasons for your answer, comparing its rainfall with that of any other district you know. (L.U.)
6. Explain exactly what is meant by the statement—"The average rainfall of the Thames Basin is 26 inches." What are the chief causes that determine the distribution of rain? (C.P.)

10. Climate (*continued*).

1. Set up a thermometer on a shady wall. Read the temperature twice daily at 9 a.m. and 3 p.m. Keep a record of the temperatures.

2. Set up maximum and minimum thermometers by the side of the ordinary thermometer.

Keep a record of the temperatures, and calculate the mean daily temperature.

Make a special note of the temperatures which occur during periods of calm weather and during days and nights when the sky is clear.

Thermometers.—A thermometer is an instrument which indicates the warmth of the substance with which it is placed in contact. If it is placed in water it shows the warmth of the water, if it be placed in the mouth or under the arm-pit it shows the warmth of the body, and if it be held in the atmosphere it denotes the warmth of the atmosphere. Many people keep records of the warmth of the atmosphere daily; and in some cases they use special thermometers to discover the coldest and the warmest temperatures recorded during the twenty-four hours. The coldest temperature is called the **minimum**, and the warmest the **maximum** temperature. Half-way between the minimum and maximum temperature is called the **mean** temperature.

Isotherms.—From the records of mean temperatures it is possible to calculate the average mean annual temperature for any place, and consequently lines, called **isotherms**, can be made upon maps in the same way as contour lines and isohyets, to denote all those places which have the same mean annual temperature.

Fig. 52 is a map of the British Isles which shows the actual annual average temperatures in connection with the elevated areas which

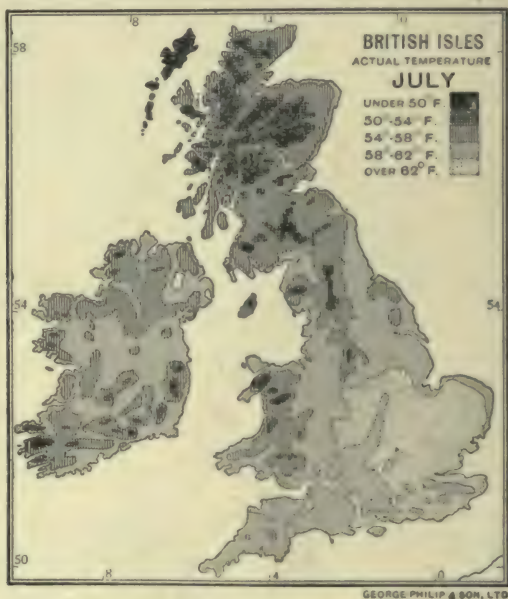


FIG. 52.—ACTUAL JULY AIR TEMPERATURES.
(Note the coldness of the hill-tops.)

are shaded. It denotes the fact that the uplands are colder than the valleys in their neighbourhood. If an attempt had been made to make this map very accurately, the isotherms would have been drawn with many turns and twists in them, and this would have made the map very awkward to read; consequently, this map shows that actual temperatures can only be shown in a very incomplete way on a map of a large stretch of country.

It is known that temperature, *i.e.* degree of warmth, decreases



Emery Walker sc.

FIG. 53.—AVERAGE ANNUAL AIR ISOTHERMS.

steadily in going uphill ; and therefore it has been found more convenient to make isotherm maps to show sea-level temperatures only, as the isotherms for sea-level temperatures are much simpler lines than those for actual temperatures, which are influenced by the varying elevations of the land. Therefore, isotherms represent temperatures for imaginary flat countries without hills, and isohyets represent rainfall for the countries with the elevations which actually occur.

Sunshine and temperature.—The warmth of the atmosphere depends on the sun, and varies with the length of the time during which the sun is actually shining, and with the height of the sun above the horizon. Consequently, the temperature of a place is intimately connected with its latitude ; places near the equator are hot and places near the poles are cold.

It should be expected, therefore, that isotherms should resemble parallels of latitude and have an east and west direction across the map. As a general rule, isotherms lie east and west, but it is necessary to note certain cases where this rule does not hold.

Fig. 53 shows certain annual isotherms, which are arranged as if the land were a level plain just a little above sea level. Isotherm 80° F. is very different from a parallel of latitude ; in the north it resembles the tropic of Cancer, but in the south sometimes it crosses the equator and sometimes it crosses the tropic of Capricorn, which is 1600 miles away from the equator.

Isotherm 32° F., which indicates that on the average the air is just as cold as freezing water, differs from a parallel in the Northern Hemisphere. Over Canada it crosses lat. 50° N. and near the north of Norway it crosses the Arctic Circle (lat. $66\frac{1}{2}^{\circ}$ N.).

Winter in the British Isles.—Fig. 54 shows that the special warmth which occurs in the atmosphere in the neighbourhood of the British Isles during the winter months extends roughly over the whole of the north-eastern Atlantic Ocean. The isotherms show that the air in Britain is warmer in January than in the north-east of the United States which is nearer the equator. The shaded area of the ocean (Fig. 54) indicates that in those parts of the sea the water is so cold that the ice will not melt, and that in the unshaded portion any ice which floats southwards from the polar seas will soon be melted and disappear. The waters which wash the shores of the British Isles are thus much warmer than those which wash the shores of Newfoundland, and the rivers which flow into the Irish Sea and the North Sea are not frozen over like the river St.

Lawrence. The harbours of Britain are, therefore, not troubled with ice like the harbours of Labrador, and like those of Quebec and Montreal.

Off the eastern coast of the United States a current or river of warm water flows northwards, it is called the **Gulf Stream** (Fig. 54). This current supplies a large quantity of warm water upon the surface of the Atlantic Ocean to the south-east of Newfoundland (A, Fig. 54). The winds of the Atlantic Ocean are the westerlies and they blow most strongly during the winter, and these winds drive the

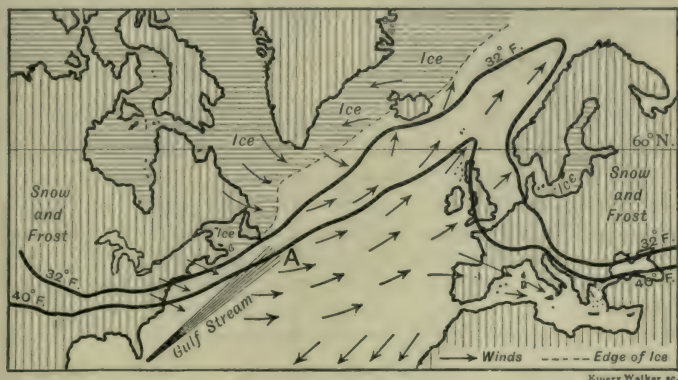


FIG. 54.—THE WINTER WARMTH OF THE NORTH-EASTERN PORTION OF THE ATLANTIC OCEAN.

(Note the similarity between the air temperatures in Britain and France as shown by the January isotherm, 40° F.)

warm water from the area marked with a letter A upon the map in front of them towards the north-east of the Atlantic Ocean, and consequently the water near Britain is made much warmer than it would be without the help of this south-westerly drift, which is sometimes called the **Gulf Stream Drift**, and is often called the Gulf Stream, but as the current is indistinguishable from the general Atlantic circulation east of Newfoundland this name is incorrectly applied to the waters which reach our shores. The British Isles are thus warmer in winter than would be expected; they are warmed by heat which is brought from the hot seas near the equator part of the way by the Gulf Stream, and the remainder of the way by the south-west and westerly winds and by the south-westerly drift of the surface waters of the ocean.

How Britons benefit.—It is not incorrect to say that the whole development of Britain and the British people, and consequently the whole development of the British Empire and the history of the world, is due to this special warmth which is brought to the British Isles by westerly winds and ocean waters during the winter months. Lack of space prevents mention of more than one or two matters in this connection. First, this warmth is responsible for the development of fisheries in the British Seas, off Norway and on the Grand Banks of Newfoundland. In the early days, the lives of many men in Britain and in the neighbouring lands in Europe depended upon the food which was obtained by fishermen in these seas ; the discoveries and early colonisation of Canada were stimulated by the fisheries off Newfoundland ; the Vikings grew to be a populous and daring nation owing to the fisheries they established on their coasts, and who can say how much Britain owes to the stimulating inroads of the Vikings ?

Secondly, the rainfall in Britain is constant ; the rainfall in Labrador in the same latitude consists of summer rains with very cold winters. The uplands of Britain are therefore grass-covered, while the uplands of Labrador are bare of vegetation except during the short summer. Consequently, Britain in the Middle Ages became famous for its sheep and its production of wool. Out of this industry grew the manufacture of woollen cloths, and from the manufacture of woollens, people passed to the manufacture of cottons. Cotton manufacturing in Great Britain is the most important single industry which occurs anywhere in the world in a single country. No man can really estimate the exact importance to Britons of the cotton trade, which grew up and has been maintained because the uplands of Britain received rainfall all the year round.

Thirdly, the winter warmth of Britain made farming possible, and combined with the wetness of the climate made the British farmer pay great attention to the quality of the sheep and cattle which he reared. Consequently, the British farmer has been supplying all the great grazing lands of the world with the finest specimens of farm animals for at least fifty years. Also, the farmer in Australia, in New Zealand, in Argentina and in North America is indebted to the farmer in Britain for the high excellence of his herds of cattle and flocks of sheep. The farmer in those distant countries has thus grown rich and prosperous because Britain was a farming country and not, like Labrador, a frozen waste.

SUMMARY.

The air is colder the higher the altitude or the higher the elevation.

Isotherms are imaginary lines like meridians : they serve to indicate the temperature of the air : all places on one side have temperatures below the number of degrees Fahrenheit affixed to the line.

Annual isotherms run roughly from west to east across the world. 80° F. is the most unlike a parallel of latitude.

Because the British Seas and the British atmosphere are unusually warm in winter the January isotherms, 32° F. and 40° F., make great loops to the north away from the equator : parts of these isotherms run north and south.

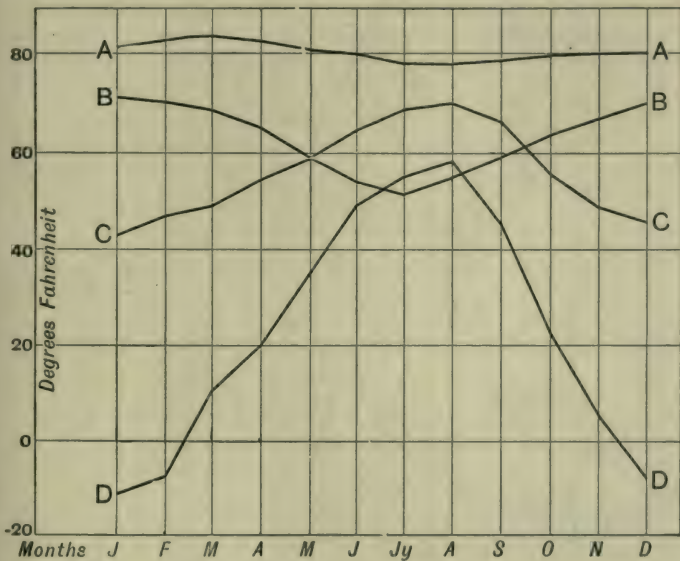


FIG. 55.—TYPICAL TEMPERATURE CHANGES.

A = Accra (equatorial).
C = Bordeaux (insular).

B = Melbourne (Southern Hemisphere).
D = Tobolsk (continental).

EXERCISES.

THE USE OF CLIMATIC FACTS IN LOCATING DISTRICTS. — On pp. 645 different types of rainfall graphs have been considered. Fig. 55 shows different types of temperature graphs.

A shows the variations in temperature at Accra in British West Africa; it represents temperature changes near the equator.

B and *C* refer to Melbourne, Australia, and Bordeaux, France, respectively. The two lines have similar slopes, and indicate temperatures about lat. 40° on the sea coasts in the Southern and Northern Hemispheres respectively. Sea-coast towns between the equator and lat. 40° would yield curves with less inclined slopes than *B* or *C*. Sea-coast towns between lat. 40° and the Poles would yield curves with steeper slopes and with the hottest month lower down the scale.

D refers to Tobolsk, Siberia; and indicates how the steepness of the slopes increases with distance from the sea.

Consequently, if a temperature graph is made with a scale of temperature $40^{\circ} = 1$ inch, the slope of the graph indicates (i) the hemisphere, (ii) the latitude, and (iii) the nearness to the sea of the place.

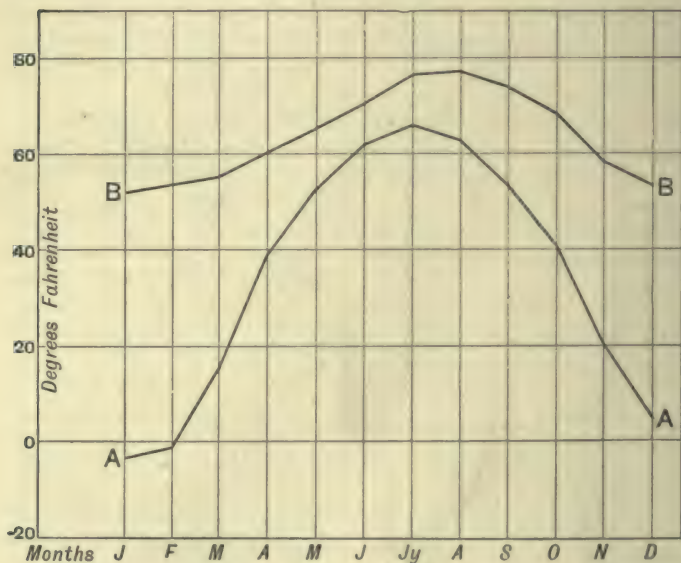


FIG. 56.—TEMPERATURE GRAPHS.

If such a graph be compared with a rainfall graph made similarly to Fig. 46, the location of the place can be determined with fair accuracy.

For example; consider the following question:

The following figures give the mean monthly temperature and rainfall for two places, *A* and *B*. State to what part of the world each may belong, and give reasons.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
<i>A.</i> { Temp. ° F.	-4	-2	15	39	52	62	66	63	54	41	21	5
{ Rain (in.)	0.8	0.9	1.1	1.6	2.3	3.4	3.0	2.6	2.1	1.6	1.0	0.9
<i>B.</i> { Temp. ° F.	52	53	55	59	65	71	77	77	74	67	59	54
{ Rain (in.)	4.1	3.1	3.7	2.6	1.1	0.5	0.2	0.6	2.0	3.8	4.0	3.8

(C.S.C.)

Fig. 56 shows the temperature graphs.

The quarterly rainfall is calculated as follows :

	Jan. Quarter.	April Quarter.	July Quarter.	Oct. Quarter.
<i>A.</i> { Total (in.) -	-	2.6	5.0	9.0
{ Per cent. -	-	12	24	42
<i>B.</i> { Total (in.) -	-	11.0	7.4	1.3
{ Per cent. -	-	37	25	4

The temperature graphs indicate :

- (i) both places are in the Northern Hemisphere ;
- (ii) *A* is probably an inland place warmer than Tobolsk ;
- (iii) *B* is probably a sea coast place warmer than Bordeaux.

The rainfall totals, *A* = 21.3 in., *B* = 29.5 in., indicate that neither place is near a coast with permanent on-shore winds.

The rainfall percentages indicate :

- (i) that *A* has summer rains ;
- (ii) that *B* has winter rains.

All the facts combined indicate :

- (i) that *A* lies in the interior of North America or Eurasia, with very cold and dry winters, and is probably about lat. 50° N. ;
- (ii) that *B* lies on the shores of the Mediterranean Sea or in California.

1. A certain place shows the following average monthly temperature and rainfall figures :

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temp. in ° F.	80	79	79	80	80	80	81	81	81	81	82	81
Rainfall (in.)	8	11½	12½	13	9	5½	3	3½	2	1½	3	4

(a) Convert the figures into diagram form.

(b) What do you consider the striking features of the figures?

(c) What can you say about the locality of the place? (L.U.)

2. *A*, *B* and *C* are three Atlantic seaports. Their temperature and rainfall figures are shown below :

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temp. in ° F. { <i>A.</i>	32	35	39	45	50	59	60	62	56	48	40	35
{ <i>B.</i>	55	57	59	63	68	70	77	79	72	65	60	55
{ <i>C.</i>	50	50	57	66	73	78	82	80	75	67	60	50
Rainfall in inches. { <i>A.</i>	1	1	2	1	2	3	3	3	2	2	2	2
{ <i>B.</i>	3	2	3	2	1	½	½	½	½	3	3	3
{ <i>C.</i>	4	3	4	3	4	5	6	6	6	4	3	3

Where are they?

3. What instruments are used for measuring (a) the temperature of the atmosphere, (b) the amount of the rainfall? (C.G.H.)

4. Write an explanatory note on each of the following terms: Trade winds, monsoon, Gulf Stream, isotherms. (Ont. Sch.)

5. In what parts of the world is the difference of temperature between the hottest and coldest months (*a*) greatest, (*b*) least? How do you account for these differences? (*O.U.L.)

11. Noteworthy Climatic Regions: India and the British Isles.

1. Trace from a map in your atlas, on as large a scale as possible, the coast lines of the countries between 30° N. and 30° S. lat. and 30° E. and 100° E. long., and the chief meridians and parallels which occur in the district.

Mark the point lat. 30° S., long. 33° E. with a letter *a*, the point lat. 20° S., long. 41° E. with a letter *b*, and the points (10° S., 46° E.), (0° , 54° E.), (10° N., 65° E.) with letters *c*, *d*, *e* respectively.

Draw a curved line through these letters, and continue the line to Bombay and towards Cape Town. Write along the line the phrase, "The track of steam vessels in January from the Cape to Bombay."

On the same map mark the points (35° S., 71° E.), (30° S., 77° E.), (20° S., 81° E.), (10° S., 83° E.), (0° , 84° E.), and join them by a line terminated at Bombay and Cape Town, and passing close to the west coast of India. Label this line "The track of sailing vessels in January from the Cape to Bombay."

Mark similarly the points (30° S., 33° E.), (20° S., 41° E.), (10° S., 49° E.), (0° , 57° E.), (10° N., 66° E.). Draw a line and label it "The track of both sailing vessels and steam ships from Bombay to the Cape in January." Write a short account of what you notice about the differences between these tracks. Consult Fig. 57 for wind directions north of the equator, and state any facts you notice.

2. Proceed as in the previous exercise to make a map to show the tracks between the Cape and Calcutta in January.

	STEAMSHIPS.	SAILING VESSELS.	
	Both ways.	Cape to Calcutta.	Calcutta to Cape.
Lat.	Long. E.	Long. E.	Long. E.
35° S.	—	82°	—
30° S.	35°	84°	37°
20° S.	54°	89°	70°
10° S.	65°	90°	85°
0°	77°	93°	86°
10° N.	84°	92°	$86\frac{1}{2}^{\circ}$
20° N.	87°	88°	87°

State briefly the facts you notice.

3. Proceed in a similar fashion to make a map to show the tracks of sailing ships across the Indian Ocean in the month of July.

Consult Figs. 57 and 58 for the wind directions north of the equator, and state the differences you notice between the tracks in January and those in July. Can you give any reasons for these differences?

	Cape to Bombay.	Bombay to Cape.	Cape to Calcutta.	Calcutta to Cape.
Lat.	Long. E.	Long. E.	Long. E.	Long. E.
35° S.	55°	30°	70°	30°
30° S.	58°	44°	77°	44°
20° S.	55°	66°	86°	72°
10° S.	51°	73°	87°	91°
0°	53°	76°	88°	92°
10° N.	63°	75°	88°	89°
15° N.	69°	74°	88°	84°

Sailor's weather charts.—The safety of ships, and the lives of the crew and passengers, depend frequently upon the knowledge which the captain should have gained concerning the probable nature of the winds and storms which he may encounter upon the voyage. Since British ships navigate the waters of the globe more frequently than the ships of any other nation, the British Meteorological Office has made it part of its business to issue regularly, for the information of captains of ships, charts or maps showing the probable weather which may be experienced in the Indian Ocean and in the North Atlantic Ocean in each of the twelve months of the year.

The information conveyed by these charts is compiled from the records which have been supplied to the Office during the past half century by the captains of ships who have sailed in these waters. The captains have been able to supply information of this kind because they keep records of the direction of the winds, the storms, which they meet, and because they record regularly the readings of their thermometers.

Figs. 57 and 58 have been made from the charts issued by the Meteorological Office, from which all the information regarding the conditions on the sea have been copied, while the information concerning conditions over the land has been taken from other records.

The Indian Ocean in January.—Fig. 57 shows that during January the monsoon winds blow from the north-east, roughly from

the shores of India to the equator, just as the north-east trade winds blow in the Atlantic and Pacific Oceans.

In the middle of the Indian Ocean the sea water has a temperature of 80° F. or more, and near the land the temperature of the sea is warmer than 70° F. and cooler than 80° F. The temperatures of the air are higher than 80° F. over the warmest parts of the sea, between 70° and 80° F. in the region of the



FIG. 57.—JANUARY CONDITIONS IN THE INDIAN OCEAN

(Note the southern limit of the North-east Trade wind AB, the area of the North-west Monsoon which blows over the north of Australia, between lines AB and CD, and the limits of the South-east Trade Winds CD in the north and EF in the south.)

north-east monsoon and over the neighbouring coasts, between 50° and 70° over most of the remainder of the land, and less than 50° F. over the mountains of Abyssinia, of Western and Northern India.

In January, India and Arabia have their cool season. In India, the winds (the N.E. monsoon) blow from a cool area to a warmer one, and from the land to the sea. Consequently, the moving air

gradually gets warmer, and therefore drier, and there is little rainfall in India in January.

In south-east India, in the neighbourhood of Madras, and in the north-east of Ceylon, the warm air of the north-east monsoon is chilled by the cool air which lies over the land, and consequently the chilled air becomes wetter and rain falls on the Madras and Ceylon coasts.

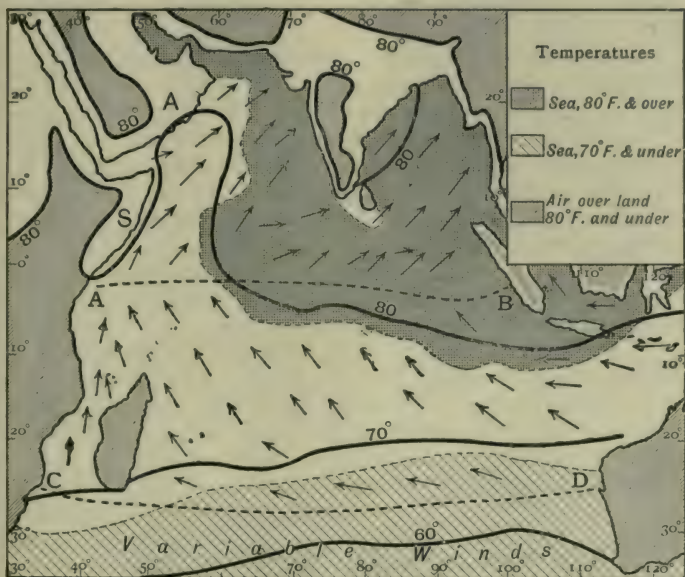


FIG. 58.—JULY CONDITIONS IN THE INDIAN OCEAN.

(S=Somaliland; A=Arabia; dotted line AB equals northern limit of the South-east Trade Wind and the southern limit of the South-west Monsoon. Note the area where the air and sea temperatures are both higher than 80° F., on the average.)

The Indian Ocean in July.—Fig. 58 resembles Fig. 57, but shows the conditions during the month of July, when India, Arabia, and Abyssinia have their hottest season.

The south-west monsoon winds blow from the ocean towards India, and have a temperature higher than 80° F. So long as the south-west monsoon blows over the ocean its temperature is about the same as the temperature of the sea-water, which is higher than

80° F. all round the Indian coast, except just in the neighbourhood of Ceylon ; but when the monsoon blows over the land its temperature is altered. In the neighbourhood of the Western Mountains, *i.e.* the Western Ghats, the temperature sinks below 80° F., and the same effect occurs in the neighbourhood of Persia, Afghanistan, and of the Himalayas. Over lowland India, especially in the neighbourhood of the desert of Thar, the temperature of the air remains about as high as over the ocean, *i.e.* higher than 80° F.

Consequently, the monsoon winds pass over warm water and absorb the moisture which evaporates from the sea ; as soon as the monsoon reaches the south-west coast of India or the coasts on the eastern side of the Bay of Bengal, the air becomes cooler, and the chilled air drops its superfluous moisture as rain. Therefore, in the month of July, most of India receives rains, which are heaviest on the slopes of the Western Ghats and the Himalayas. The Thar Desert, however, is rainless, since the winds are not chilled as they pass over the desert. These winds continue their journey, and eventually are chilled in the neighbourhood of the Himalayas, and drop their rain on the slopes of these mountains.

In a similar fashion, the dry or arid region of Somaliland (*S*, Fig. 58) has no chilling effect on the monsoon winds which pass over the country from the Indian Ocean, but these same winds when they reach the Abyssinian mountains are then chilled, with the result that Abyssinia has heavy monsoon rains in July.

Monsoon rainfall and winds.—The Indian Ocean is the largest region in the world where the wind changes its direction with the seasons. North of the equator the wind is N.E. in January and S.W. in July. The word **monsoon**, which means seasonal, is used to describe winds of this kind. Because one wind causes rain to fall and the other wind fails to bring rain, the rainfall of India is designated by the term **monsoon rainfall**.

Similar wind changes occur in the Western Pacific Ocean, so that China has monsoon winds and monsoon rainfall similar to those of India.

North Australia has monsoon rainfall at the opposite season to that of India.

January (winter) conditions in the North Atlantic Ocean.—Fig. 59 was made in similar fashion to Figs. 57 and 58. In the North Atlantic Ocean between the equator and the tropic of Cancer, the north-east trade wind blows in January over sea water which

has a temperature of 70° F. or more. North of the tropic the winds are the westerlies, *i.e.* winds which blow from the W., S.W., or N.W. as a rule throughout the month. The sea water in the north of the Atlantic Ocean is colder than 50° F., and the map shows that there is more cold sea water on the American side than on the European

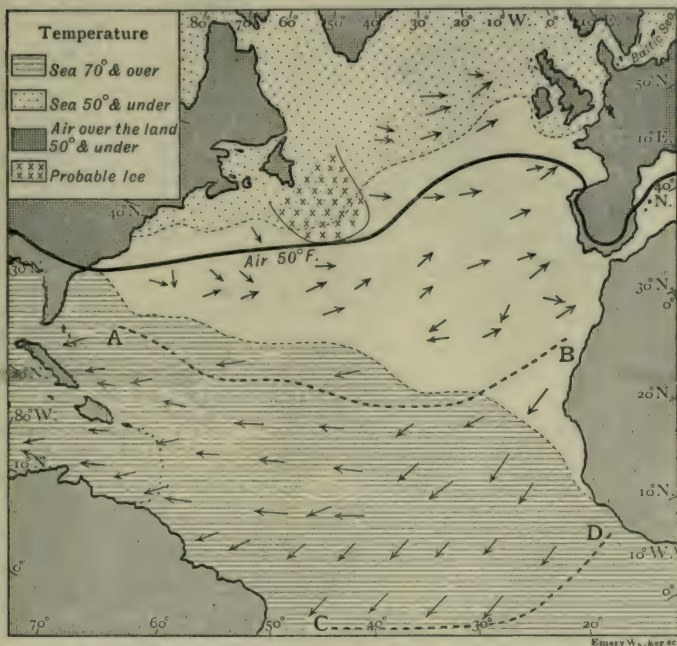


FIG. 59.—JANUARY CONDITIONS IN THE NORTH ATLANTIC OCEAN.

(Compare with this map the January isotherms 32° F. and 40° F., Fig. 54, p. 75, and the direction of the Gulf Stream. Note how far south the line AB lies; it marks the southern limit of the Westerlies which reach Spain and Morocco in winter only. Note that the sea off the west of Ireland is warmer than the North Sea.)

side. Consequently, the air over the sea is warmer on the European side than it is on the American side in the same latitudes.

The westerlies, which leave the shores of America, are warmed as they pass across the ocean, and absorb moisture during the journey. They reach the British Isles, and only when they are close to our shores, or actually blowing over our islands, do they get chilled. Consequently, the westerlies bring warmth and rain to the British Isles in January.

Fig. 59 shows that in January there is a large region to the south-east of Newfoundland where ships are likely to meet ice floating in the ocean. This fact indicates quite clearly that the sea and the air in the neighbourhood of Newfoundland are much colder than the sea and air in the neighbourhood of the British Islands, where sea ice is rarely seen.

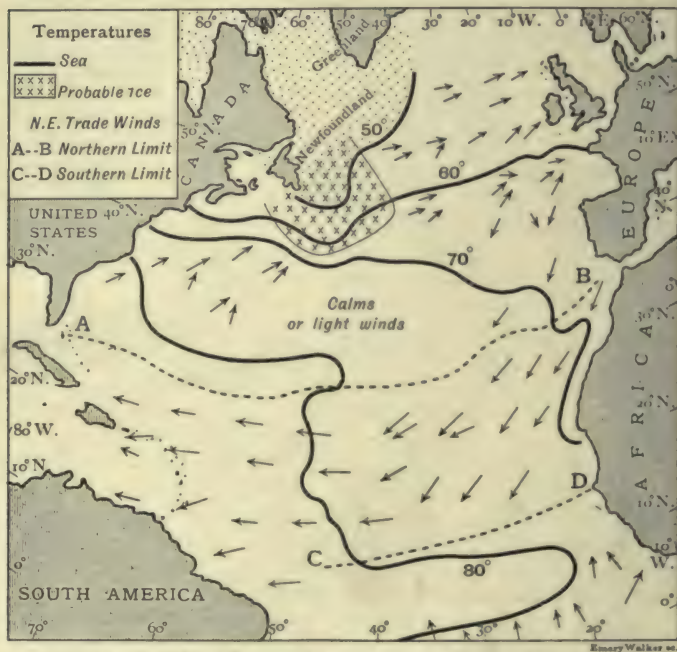


FIG. 60.—JULY CONDITIONS IN THE NORTH ATLANTIC OCEAN.

(The air is everywhere warmer than 50° F., except over Greenland and on the hill-tops (compare Fig. 52). Note (i) the coldness of the sea below 50° F., between Greenland and Canada; (ii) the great warmth of the sea, over 80° F., off the shores of South America and in the Gulf of Mexico; (iii) the coldness of the sea near North-West Africa.)

July (summer) conditions in the North Atlantic Ocean.—

Fig. 60 shows the facts for the North Atlantic Ocean in the summer time. In the south, the north-east trade winds blow over the ocean, which is cooler near to Africa than it is further west near the American shores; in the north, the westerlies blow towards the British

Isles where the sea is warmer than it is in the east near the shores of Canada.

Sea ice may be met in the neighbourhood of Newfoundland. The air over the land is warmer than 50° F. everywhere except on the mountains and in Greenland. Consequently, the on-shore winds which reach Western Europe and the British Isles during July bring rain in that month as in January.

The special winter warmth of the British Isles.—Figs. 59 and 60 show that the winds which reach the British Isles blow in the same direction winter and summer alike, and that the seas round the British Isles are warmer than the seas round Newfoundland; consequently the British Isles are fairly cool in summer but exceptionally warm in winter. In summer, the temperature of the air over the British Isles is about 60° F., so that the westerlies exert very little influence in warming the air over our islands, but in winter the air over the land is about 40° F., while the westerlies have a temperature of about 50° F. and so warm the air over Britain.

The effect of these winds on man.—In India, the rains fall in the warmest weather, consequently the Indian peasant, who depends for his life upon the crops which he may obtain from his small portion of ground, sows his seeds and waits for the warmth and rainfall of the hot season to make them sprout and bring forth their harvest. The monsoon always brings rainfall to some parts of India, but in different years different small districts may not receive any rain, and then the peasants in these dry districts have no harvest to reap. Their sole means of subsistence thus fails, and the British Government in India has to take steps to provide these peasants with food, to prevent the famine, as well as the disease and death which famine inevitably brings.

The monsoon rainfall, therefore, is the chief mainspring of Indian life, and is so important that the Government officers in India send a cablegram annually to London, on some day in the month of May, with the message: "The monsoon has burst." This message signifies that the first monsoon rains have occurred with the S.W. monsoon. From May to September record is carefully kept of the districts which the monsoon has not yet reached, so that the Government may be prepared for a possible outbreak of famine and pestilence.

Equally important to Britons is the warmth which the westerlies bring in winter. If the westerlies failed to blow, the British Seas would be frozen over, Britain would be entirely frost-bound, and

most of the work which occupies many of the workers in Britain would be at a standstill. The farmers would be very busy taking special care of their flocks and herds, and they would be put to great expense to maintain them through the very wintry weather. All factories would find increasing difficulties with reference to their supplies of water both for their steam engines and for their manufacturing processes; life and work of all kinds would be more difficult and more expensive.

It is thus no exaggeration to say that the whole prosperity of Britain is bound up with its specially mild winters. Indeed, it is possible to assert that if the British Isles had had the same kinds of winter as are experienced in Labrador and Newfoundland, Britain would not have been the home of a mighty nation, or of a people who lead in commerce and industry among the nations of the world.

SUMMARY.

In January the north-east monsoon blows away from India; therefore, India is dry. In July the south-west monsoon blows towards India; therefore, India is rainy.

The heaviest monsoon rains fall on the Western Ghats and the Himalayas, especially in Assam. Ships approaching Newfoundland are always likely to meet ice floating on the sea; therefore, Newfoundland is colder than Britain, although further south. The specially warm winters of Britain have made Britain populous, while Labrador in the same latitudes is an unpopulated desert.

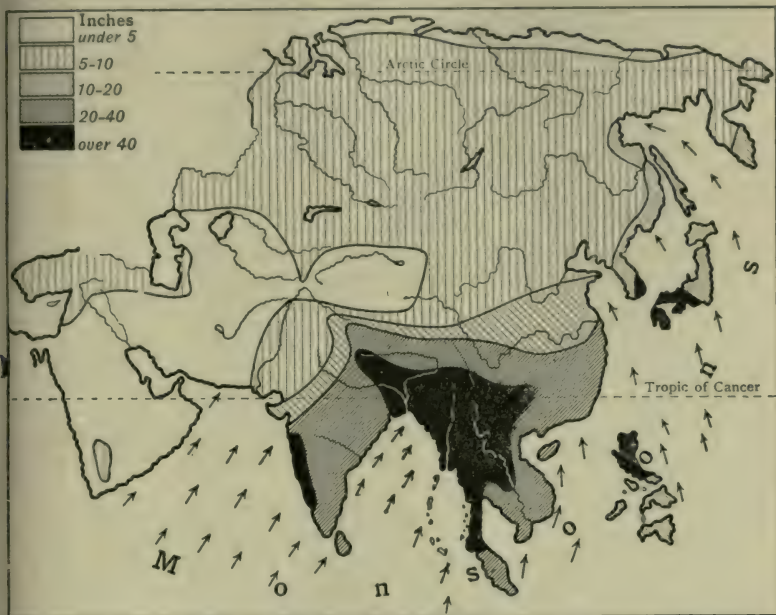
The might and power of India are due to its monsoons, the wealth and prosperity of Britain are due to its winter warmth.

EXERCISES.

1. The climate of a place depends upon certain conditions. State and explain at least three of these conditions. (Mad. Sch.)
2. Point out how the climates of Newfoundland and Northern France differ so essentially, although these countries are in the same latitude. Explain the reasons of this. Show how the differences in the climate affect the life and work of the inhabitants. (*Newf. Sch.)
3. What are the monsoons? Show precisely how they affect the climate of India (a) in January, (b) in July. (C.G.H.)
4. What are monsoons? Give a brief account and say how India benefits by them. Account for the fact that the desert of Rajputana (Thar) is practically rainless, though the south-west monsoon deposits 50,000 tons of water per acre on the Panjab slopes of the Himalaya *after crossing the desert*. (Mad. Sch.)

TEST PAPER.

1. The accompanying chart (Fig. 61) shows the mean rainfall in Asia from May to October. Explain the causes producing the results shown, and trace any connection that may exist between rainfall and density of population. (N.Z. Ed. Dept.)



Emery Walker sc.

FIG. 61.—RAINFALL IN ASIA. (May to October.)

2. How is climate affected by (a) latitude, (b) altitude, (c) winds, (d) ocean currents, (e) mountains, (f) stretches of land and water? Explain fully, illustrating each case. (Ont. Sch.)

3. What are the chief differences between the climate of a district in the tropics and that of one in the British Isles? Account, as far as you can, for the differences you mention. (*O.U.L.)

4. Describe the climate of the district in which you live, and show what conditions govern that climate. (Melb. U.)

12. Forests.

1. Write a brief note to show the differences which you have observed in the character of the grass which grows on hill-sides in comparison with the grass which grows in a flat meadow near the banks of a meandering stream.

2. Make a list of the trees which grow in the neighbourhood of your school. Specify in the case of each tree

- (i) the *kind of soil* in which it grows, whether it is clayey, sandy or gravelly ;
- (ii) the *position* of the tree with regard to water, whether it is near a stream or a pond, or far away from streams or ponds ;
- (iii) its *elevation*, whether it grows on the highest land or the lowest land in the vicinity ;
- (iv) its *surroundings*, whether it grows in a place exposed to, or sheltered from, the winds.

Make sketches of the shapes of those trees which grow in exposed places, to show whether the branches grow better on the sheltered or exposed side of the tree.

3. Consider the rainfall map, Fig. 43, and the relief map, Fig. 2. Forests are found to be developed extensively in those districts where the rainfall is greater than about 30 inches per annum, and especially on the wet slopes of mountains ; mark on an outline map of the world those regions where you would expect to find dense forests. Make a list, on the margin of the map, of the countries which you would expect to contain a large proportion of forested land.

4. Consider the rainfall map, Fig. 43. Grasses and similar plants are the only vegetation which can grow naturally in those regions where the rainfall is between 10 and 30 inches annually ; mark on an outline map of the world those areas where you would expect to find grasses growing extensively, accompanied by an almost entire absence of trees. Make a list, on margin of the map, of the names of those countries where you would expect to find a large proportion of the area grass-land.

Forests.—Forests are important geographically for two reasons. First, they determine the manner of life and the kind of work of those people who live in them or on their edges ; they compel men to gather the produce of the trees, and to sell this produce to procure food for themselves and their families. Consequently, forests compel the men who make use of them to remain in a low state of civilisation, for such men depend largely upon their luck in finding excellent specimens of the produce of the forest, and forests do not force men to take precautions against possible starvation during



Emery Walker sc.

FIG. 62.—THE WORLD'S FORESTS.

(Note the effect of the mountains of Central Asia in making temperate forests possible in North India, etc.)

later years ; for when men have exhausted the resources of one portion of the forest they may move away to another portion, which they exhaust in like manner.

Forests are important, secondly, because they tend to keep the peoples who inhabit the lands on either sides of them apart. There are few roadways or tracks through forests, and the forests themselves do not support dense populations, so that they hinder both trade and communication between lands on either side.

Forested regions are important, then, for the produce which men collect there, and are responsible for the relative sparseness of their population.



FIG. 63.—CONIFEROUS FOREST IN THE CANADIAN ROCKIES.

(Note the snow on the distant peaks, the railway line which is part of the great railway across Canada.)

Forests and rainfall.—Trees are the largest and longest lived form of vegetation ; therefore, trees can only grow well in districts which are rather warm and rainy during the season when the trees grow. Consequently, as a general rule, forests are to be found only in those districts where the rainfall is at least 30 inches annually. Because mountainous slopes usually help to make a district where there are on-shore winds a rainy district, forests frequently clothe the seaward slopes on mountains which are near the coast.

Forests and temperature.—Certain kinds of trees—cone-bearing (coniferous) trees like the pine, and deciduous trees such as the oak—only grow in regions where there is a cold season when it is too cold for any growth in the tree. Deciduous trees drop their leaves during this cold season. Consequently, pine trees are to be

found in those countries where snow lies on the ground in the winter for many weeks, and deciduous trees grow in countries where there is a possibility of snow falling during the winter.

Other trees, like the walnut and certain kinds of chestnut, grow best in countries which have a dry hot summer; and where there is little chance of winter frosts. The various kinds of palm tree grow in hot regions where there is only a slight rainfall and where the temperature is rather high throughout the year. Other trees, like the teak and mahogany trees, only grow in those countries where there is abundant rainfall and abundant warmth all the year round.

Forested regions.—Coniferous trees—firs, pines, etc.—are the typical trees of the inland portions of the continents of North America and Eurasia where the rain falls during the summer months and where it is very dry and very cold during the winter.

Deciduous trees are found in temperate countries like the British Isles, British Columbia and New Zealand, frequently on the seaward slopes of the hills and mountains. The winter is cold enough to cause the leaves to drop from the trees, and the summer is warm enough and the rainfall sufficiently large for the trees to clothe themselves with luxuriant foliage during the warm weather and to produce their seeds in abundance.

Winter rain regions, *i.e.* regions with a climate similar to that of the Mediterranean shorelands, have characteristic trees, such as the evergreen chestnuts, the olive tree and fig tree, and the grape vines. Palm trees are characteristic of those lands which lie on the edge of the hot deserts where the weather is always hot and rain sometimes falls. Consequently, the tiny islands which occur scattered over the tropical portions of the Pacific Ocean, *e.g.* the Fiji Islands, have but one characteristic tree, the coconut palm.

The equatorial regions, where the temperature is on the average about 80° F., and the rainfall is on the average about 80 inches per annum, are regions of dense forests, in which the chief trees of commercial importance are teak and mahogany. In these forests the undergrowth is so dense that it surrounds all the trees, while creeping plants twine their way round the trunks of the large trees in an effort to penetrate to the sunshine which brightens the tree tops, but cannot reach the ground as it cannot penetrate the thick vegetation made by the interlocked branches of the trees. The ground is always in semi-darkness even at noon-day. Some of these creepers yield rubber. Such lands are the valleys of the Amazon and the

Congo, and the interior portions of the Malay Peninsula and the East Indian Islands. Portions of India are likewise covered with dense tropical forest. Fig. 76, p. 123, is a scene in Central America. The white overseer is directing the work of native labourers ; what are they doing ?



Photo Underwood & Underwood

FIG. 64.—BAMBOOS IN AN AFRICAN TROPICAL FOREST.

(Note the dense tangles of growth at the sides of the track ; note also that goods are transported by human carriers.)

The influence of forests upon man.—The coniferous forests of the Northern Hemisphere provide work for men during the winter. Such men, who are called **lumberers**, penetrate the forests at the approach of winter, build themselves log houses, cut down many of the trees and drag the trimmed tree trunks across the snow-covered ground to the nearest frozen stream. When the snow and ice melt, lumbering ceases ; the men then guide the logs down the streams and rivers to the saw-mills. On some of the rivers of Eastern Canada, like the Ottawa, logs are bound together to form

large wide rafts, on which huts are built for the use of the men on their long water journey to the mills. In Sweden and in New Zealand the rivers are not wide enough for such large rafts, and the logs are piled on the top of each other and so floated in large bundles to their destination.



Photo Underwood & Underwood

FIG. 65.—LUMBERING: COLLECTING LOGS ON A SWEDISH RIVER.
(Note that white men do this work.)

The lumberers of the Rocky Mountain forests find that the rivers are of little use to them for transporting the timber, but they make great use of the slope of the ground. When the tree has fallen and been trimmed, a wire hawser, or rope, is fastened to it and it is dragged down hill with the help of a steam engine which winds the hawser round a drum.

Timber is needed in all parts of the world for local use, such as the building of houses; and in the manufacturing and mining parts

of the world there is a great demand for timber. Consequently, the forests provide occupation for many lumberers.

Besides the actual timber obtained from the forests, other forest products are wood pitch, resin, turpentine and wood pulp. Many men, therefore, earn a livelihood in obtaining these products, in preparing them for sale, and in transporting them from the forests to the markets where they are bought. In the canals of Eastern Canada, one-tenth of the weight of goods carried consists of forest produce.

Forests are also useful to man in other ways. In the South of France, for example, the hillsides are clothed with trees. In some cases the trees have been cut down so extensively that the rain water rushes down the slopes so rapidly as to wash away most of the soil, leaving the barren rock exposed; consequently, men are trying to make these districts forests again, to preserve the soil. Many farmers in different parts of the world use trees as a protection to their crops. In windy countries, the trees are planted to windward of the fields; in very sunny countries, trees are left growing to provide shade for the crops when they are young and tender.

The influence of man on the forests.—As a rule, man is a destructive agent in the forests. Even the primitive savage destroys many acres of trees by fire so that he may have a small patch of ground on which to grow the few simple crops which he needs, *e.g.* the free negroes in the West Indies clear the ground for agriculture in this wasteful way.

Similarly, in New Zealand, which is by nature a forested country, the settler cuts down the trees, lets them lie to dry, and then sets fire to them. He then sows English grass seed and turns flocks of sheep to feed upon the growing grass.

In some countries, such as the eastern parts of the United States, the forest has been destroyed within the last hundred years in the same wasteful manner; and in England and Germany the farmlands which dot the landscape so pleasantly in the summer sunshine were cleared of trees many centuries ago.

Consequently, whenever man desires to grow crops, he destroys the forests, and at the present time attempts are being made to repair these ravages by careful tree planting. In some countries the planting of trees by school children on "Arbor Day" is an established custom.

Cultivated trees.—In certain parts of the world men cultivate

trees. In the islands of the Pacific Ocean there are plantations of coconut palms, from which the planters obtain **copra**, *i.e.* the dried kernel of the coconut, and **coir**, *i.e.* the fibre of the husk of the nut, for export to the manufacturing countries of Western Europe and North America. In the Malay Peninsula, and in the neighbouring islands of the East Indies, such as Sumatra, and in Ceylon, there



Photo Underwood & Underwood

FIG. 66.—HUSKING COCONUTS IN THE WEST INDIES.

(Note the shape and size of the fruit as it is gathered. The negro workers are separating the nuts from the fibrous husks.)

are plantations where men grow **rubber** trees and creepers, and export the dried juice of these plants to be made into those rubber articles which are used in increasing quantity at the present time.

In the winter rain regions, men cultivate trees from which they obtain **figs**, **lemons**, **oranges** and **olives** for the world's markets. The vineyards of these districts and those of France and Germany provide many million gallons of **wine** annually.

In temperate regions men plant orchards of **fruit trees** : apples, pears, cherries, etc., are grown to feed people who live, in some cases, in cities more than 6000 miles away.

Cork and tanning materials, such as oak bark and sumach, are plantation products as well as products of the natural forests.

On one hand, man destroys the forests when he needs the land for other crops which appear to him at the moment to be more valuable, or when he needs the timber from the trunks of the trees ; but on the other hand man preserves those trees which he has found provide in some degree for his necessities. The balance, however, is against the trees, and until the lumberer is compelled to plant saplings to replace the mature trees which he destroys, the forests of the world will continue to decrease in area, and thoughtful people will still wonder where the people in fifty years or so are to seek for the timber supplies which they will then need.

SUMMARY.

The temperate forests contain coniferous and deciduous trees : they extend over parts of Canada, the eastern and western coast districts of the United States, Sweden and Russia. The tropical forests form a belt of dense vegetation on all the lands near the equator : Brazil, the Congo State, West Africa, the East Indies. Tropical forests provide man with teak, ebony, mahogany and rubber. In the cleared portions of tropical forest countries, rubber trees are planted.

Palm trees, from which palm oil, sago and coconuts are obtained, grow on the edges of the tropical forest of Africa and Asia : they are the only tree of many of the small islands in the Pacific Ocean.

EXERCISES.

1. Compare the intertropical part of Africa with that of South America in respect of situation and character. Show how these forest conditions affect the life of the inhabitants. (Sc. Ed. Dept.).
2. What are the essential conditions which decide the distribution of forest ? And what are the essential differences between temperate and tropical forests ? (C. P.).

13. Hunting and Fishing.

1. Wild animals disappear when the population of a country becomes dense. Examine Fig. 1 and consider the regions of the world where there are few people. Examine the rainfall map (Fig. 43), and consider the regions where there are deserts, and where the rainfall is too scanty for an extensive growth of trees.

Mark on an outline map of the world those regions where you would expect to find :

- (i) many wild animals who need the protection of furry skins against a cold winter ;
- (ii) many wild animals which subsist upon grasses, like the deer to be seen occasionally in an English park.

Make a list of the names of countries where you would expect hunters would resort to obtain skins of animals to make clothing, such as furs ; and to obtain for ornament and for sport the heads of animals like the deer for the sake of the beauty of the antlers with which such heads are ornamented.

2. Examine Fig. 67, which shows the shallow parts of the sea on the edges of the North Atlantic Ocean. Fish such as codfish and herrings live in shallow water. Make a tracing of Fig. 67 in outline, and mark upon it the districts where you would expect to see many fishing boats during the fishing season.

The tundra.—On the land which fringes the Arctic Ocean there is a short cool season, which may be called summer, but during most of the year it is extremely cold and the ground is frozen hard, and frequently covered with great depths of snow. Inland, away from the ocean, trees appear. At first these are small and stunted ; there are for example willow trees only a few inches high. Further inland are the warmer and wetter regions of the coniferous forests. This dreary district is called the **tundra**, the frozen desert. Only during the short “summer” is there any plant life, but during this short season small plants grow rapidly, and in sheltered spots even wild strawberries may be found.

There is thus food for some animals, such as the caribou or the wolf ; and, consequently, there are also some people, such as the Eskimo, who eat the flesh of the animals.

Animals like the caribou (which is a kind of deer and is similar to the reindeer) and the musk ox (which is a shaggy-coated animal like the buffalo or wild bull) feed upon vegetable life. Such animals are, therefore, found wild only in those districts where plants are



FIG. 67.—COLLECTING.

numerous, and they migrate annually from one feeding ground to another at settled seasons. For example, in Labrador, numerous caribou may be seen moving from one feeding ground to another almost on a definite date; the Eskimo know roughly when the herds will pass a certain spot, and they hunt the caribou at that time and place.

Animals like the wolf and the Arctic fox prey upon other animals.

The effect of the tundra upon man.—Since crops cannot be grown, the inhabitant of the tundra depends upon flesh for his food. Consequently, men live near the feeding grounds of the caribou and musk ox. But these animals only provide large quantities of meat when they are in good condition, and the Eskimo only hunts at certain times of the year. At other times, or when his hunting has been unsuccessful, the Eskimo becomes a fisherman; he captures seals and lives then on seal meat, which he frequently eats raw. Naturally, the tundra can only support a sparse population, which is dependent partly upon fishing as well as hunting.

Artificially, the tundra could support a larger population in two ways. First of all, the natives may learn or discover how to domesticate the animals. In Eurasia, the Lapps, for example, have large herds of domesticated reindeer, which supply them with food, clothing and milk. Such a custom is beneficial to the Lapps, and attempts are being made in Labrador to teach the Eskimo how to rear and maintain herds of such animals.

Secondly, the tundra may support hunters who sell the produce of the chase for food, which is brought to them from warmer lands. The hunters frequent the tundra to catch animals such as the fox, the sable, the mink and the bear, for the sake of their furs. Such hunting gave rise to the **fur trade**, which was the original reason for settlements in Canada, and is even now the main industry of some Canadians and some people who inhabit Northern Eurasia. The fur-hunters bring their furs and skins to trading huts which have been established and there exchange them for ammunition, traps and food supplies.

Consequently, the tundra attracts hunters, men who like to live adventurous lives in the wild parts of the world. But neither the natives nor the hunters are very numerous, and their influence upon the farmers who inhabit the warmer countries of the world is very slight; they live by destruction, as a rule, and as the wild animals die out they will become less and less numerous.

Hunting for sport.—The hunter of the tundra either earns a means of subsistence, or wins the actual food he consumes, but in Africa there are hunters who hunt for sport, for the sake of the excitement of the chase or for the trophies which they obtain. In Africa, in the regions between the hot dry sandy wastes or deserts and the densely forested regions near the equator, there is sufficient moisture to sustain the growth of plants, which die during the hot dry summer season and come to life again when it rains. In the rainier districts trees are more numerous. Such land is called **park-land**; it occurs in the districts of inland Africa where rain falls during the hot season (summer rains).

In these regions live many kinds of animals, such as antelopes, hartebeest and others of the deer kind. These animals feed upon plants; but others, such as lions and jackals, are also numerous and they feed upon antelopes, etc.

Since plants do not grow in great numbers, the native population is very scattered and these wild animals are still fairly numerous. As the white settler penetrates further and further into the interior of Africa these animals will be gradually destroyed, and hunters are even now compelled to obey certain regulations and to pay for licenses before they may hunt.

Park-lands and immigrants.—Life is comparatively easy for the native inhabitant of the park-land; consequently he is idle, and comparatively uncivilised. The men are hunters and the women perform most of the other work, preparing and growing such food crops as are required. But park-land is attractive to the white settler; so long as he builds railways, and so long as he can obtain sufficient water for his crops, the white settler tends to penetrate further and further into such regions and consequently the wild animals retreat or disappear before his advent. In Rhodesia, for example, the country receives many settlers annually, who farm the lands near the railway line, and the wild animals have been driven further and further into the Kalahari Desert.

Fisheries.—Except in the manufacturing districts of old countries such as England, most rivers and lakes contain fish which are captured for food. It usually happens that fishing of this kind does not provide for the whole of man's work, and such fishing occurs frequently in the intervals of other labour. But in some instances fishing is undertaken as a business.

On the western side of North America, the two rivers the Columbia and the Fraser teem with salmon during certain seasons

of the year. In this respect these rivers are similar to all the other rivers on this coast northwards, but only in these two rivers is salmon fishing a business. The fish are caught in automatic traps, which are regularly visited by men in machine propelled launches who take therefrom the catch. The fish are then delivered at a factory, where they are canned, and from which millions of tins of salmon are despatched annually to be sold, very largely in the British Isles.

But fresh-water fisheries of this kind are not so important as the fisheries of the sea, chiefly cod and herring. Fig. 67 shows that the North Sea, the Irish Sea, the English Channel are shallow, like the waters to the south-east of Newfoundland. In places the water is very shallow, for sandbanks rise up as hills on the submarine surface; hence the name **banks**, in the Dogger Bank (North Sea) and the Grand Banks of Newfoundland.

In such shallow seas herring and cod are numerous, and the men who inhabit the towns such as Grimsby and Yarmouth in England, and similar towns in Scotland, Holland, etc., make a business of catching these fish. In the North Sea the chief catch is herring, but other fish such as turbot and soles are also caught.

Off Newfoundland the chief fish is cod, and in the neighbourhood of the Lofoden Islands, Norway, is another cod-fishing ground. Fishermen are not numerous on the coasts of Newfoundland, and the cod-fishers visit the Grand Banks from Canada, from the United States, and from Europe.

The cod and herring fisheries give employment to many men besides those who catch the fish. Comparatively few of these fish are sold fresh; they are usually cured or dried or pickled, and the processes through which they pass give work to many. Much of the prepared fish is sent to the Catholic countries of Southern Europe or South America, where fish is a necessary food. Consequently, these fisheries give rise to an immense trade.

Fisheries and their effect upon man.—In an earlier chapter it was pointed out that sea-fisheries had an important influence upon the first ocean voyages, and upon the rise of sea-faring nations: that effect still persists, for the mercantile marine, *i.e.* the sailors of the world engaged on trading vessels, are recruited very largely from the fishing population. Norwegians are still famous as sailors, and are to be found among the crews of many ships sailing under the flags of other nations. Great fishing grounds are also important because they cause the rise of great towns upon the

coasts in certain places, *e.g.* the fringe of fishing towns along the coasts of Fifeshire and Forfarshire in Scotland.

The effect of man upon the fisheries.—Fishing, like hunting, is destructive of life, and there are many instances of the decline of fishing grounds; *e.g.* herring used to be caught in large quantities in the Baltic Sea, and the whale fishery off the coasts of Greenland has declined, while the fishery for seals in the Bering Strait has to be regulated very carefully.

Even the herring harvest of the North Sea can not be regarded as a permanent source of food supplies, and it is possible that efforts will have to be made to rear young fish in hatcheries: at the present time fishermen are prohibited from catching the smallest sized fishes.

SUMMARY.

Hunting, like lumbering, takes men away from their fellows and makes them scatter over the earth. Fishing, on the other hand, brings men together, and forces them to form villages and towns. All three industries are concerned with the destruction of life, and consequently neither lumberers, hunters nor fishermen perform labours which are high in the scale of civilisation; they work largely with their hands, and fail to produce articles of commerce which are notable because they tend to make the world a more civilised place. On the other hand, the demand for these raw products of the chase has brought about certain inventions, *e.g.* the various kinds of instruments, such as the trawl in fishing, or the tin in which the salmon is sent its 6000 mile journey, and these inventions have stimulated men's activities.

EXERCISE.

1. Describe the vegetation of (a) tundra, (b) park-land (or savannah), and describe the conditions of the life of the inhabitants. Where are such districts to be found? (*C.P.)

14. Ranching on the Grass-Lands.

1. Make a tracing of Fig. 67, and shade the area higher than 6000 feet (Fig. 2). Colour the areas of the deserts where the rainfall is less than 10 inches per annum (Fig. 43). Name from your atlas Argentina, Uruguay, Queensland, New South Wales, Victoria, South Island (New Zealand), Alberta (Canada), Kansas, Iowa, Illinois, Missouri, Nebraska (U.S.A.). These are the ranching districts: learn where they are, and learn the position

of the great towns such as Chicago, Melbourne, and Buenos Aires, which are near to these districts.

2. Consider the ranching districts marked in Exercise 1 : write a brief note upon their rainfall and temperature both in winter and summer (Figs. 43 and 53).

3. Compare the distribution of the population in the ranching districts with that in the Tundra, and that in Western Europe (Fig. 128).

Flocks and herds.—The Lapps of Northern Europe are frequently wealthy, owning herds of reindeer. In Central Africa, among the primitive tribes, whenever a man develops from being a mere hunter, he owns numbers of domestic animals, usually some variety of cattle. In days gone by, the earliest form of wealth consisted in herds of cattle, and men had such wealth before it was considered that land was a valuable possession.

Such men are still in a primitive state of civilisation, and are still entirely interested in the preservation of their own lives without regard for the lives and works of others, yet they have developed some notions of a civilised life, because they possess flocks and herds.

The rearing of domestic animals, such as cattle and sheep, is easier than the cultivation of the soil. **Graziers**, or **ranchers**, as men who do this may be called, live a nomadic existence ; they wander with their animals from one feeding ground to another, and thus such a stage of civilisation resembles the active life of the hunter. Such men use the produce of their flocks themselves. They make clothes and tents from the wool of the sheep or the skins of the cattle ; only occasionally do they sell their animals for salt or other condiments, or for firearms or other tools or weapons. They live selfish lives.

On the other hand, in the wide stretches of country which are grass-covered, in the new lands of the world, such as North America, or South America, or Australia, men own flocks or herds for the sole purpose of selling the produce of the animals. Sometimes, as in parts of Australia and Argentina, such ranchers rear sheep for the definite purpose of selling their wool to manufacturers of woollen cloth in Britain and Western Europe. In most cases these sheep-rearers aim at producing large quantities of wool and large quantities of meat, which is frozen and sent to Western Europe to feed the people who work in the factories there. New Zealanders especially are interested in this trade in mutton and

wool : the Canterbury lamb sold in the butchers' shops in Britain has been sent 12,000 miles over the sea from the pastures of those small islands.

Other ranchers rear cattle only. In days gone by, cattle were let loose upon the wide grassy plains of North America, called the **prairies**. In course of time the herds became more numerous. Each rancher branded his own cattle with a special mark, and every now and then men, called cow-boys, rode on horses to collect the cattle together. When this had been done the calves were branded with the mark of their mothers : those animals which were to be sold



FIG. 68.—RANCHERS AND THEIR PRODUCE.

were separated from the remainder, and taken in droves to the railway to be conveyed to the great meat markets. The others were again turned loose upon the prairie. Prairie ranching of this kind was eventually found to be unsatisfactory, and the modern rancher keeps his own cattle together and separate from the herds of other ranchers. Instead of letting the animals roam at will over the wide prairies the rancher keeps them within extensive fenced fields or pastures. In this way the rancher can keep better control over the animals, and is able to obtain an improved quality of meat.

The beef obtained from the cattle which are slaughtered, and, in many cases, living animals are sent over the North Atlantic Ocean to Western Europe, particularly to Britain. The beef, which is sent over in a chilled, *i.e.* a semi-frozen condition, is sold in British

butchers' shops; and the live cattle are fed upon British pastures and then slaughtered.

Argentina has herds of cattle as well as flocks of sheep on the **estancias**, as the ranches of that country are called. Uruguay resembles Argentina in these matters.

The grass-lands.—Ranching of the modern kind is the business which is first adopted by men who inhabit the wide grassy plains which are to be found everywhere in the temperate regions where the rainfall is between 10 and 30 inches per annum. In North America these lands are called **prairies**, in South America they are called **pampas**, in Australia they are called **downs**.

Fig. 68 shows where these grass-lands occur, and a comparison of this map with Fig. 43 shows that the grass-lands occur on the cold side of the hot deserts.

The influence of the ranches upon man.—Western Europe has long been unable to produce sufficient meat for the needs of its people. Meat has, therefore, been exported for many years from the ranching countries. At first, many years ago, such meat was always exported after it had been salted. Salt meat is not so palatable as fresh, and, consequently, men began to find ways in which they could supply Western Europe with fresh meat. From North America animals could be and are still sent over the ocean while alive; but live animals cannot be easily sent in large numbers the great distance from Australia to Europe, especially as part of the voyage lies through the hot tropical seas.

Therefore, the inventive genius of man found a means whereby meat could be sent from Australia to Europe in freezing chambers. Carcases of sheep were frozen at the southern ports, were placed in freezing chambers in ships which were specially fitted for the voyage, and frozen mutton speedily became an article of diet, because such mutton could be sold more cheaply than the mutton from sheep and lambs which were bred in Britain.

This invention led to the chilling process being used for beef, in this case the carcases of cattle are sent overseas only partially frozen.

An extensive development, therefore, has occurred in the meat trade, and the Australian, the New Zealander, the Argentinian have become profoundly interested in the consumption of meat in Europe. At the same time, this great trade has led to improvements in the ranching industry. If the meat is to be sold for good prices it is necessary that it should be of good quality, consequently, the rancher has improved the quality of his flocks and herds. For this

purpose he bought specially well-bred animals from Europe, and this necessity has led the British farmer to devote, in some cases, all his energies to rearing a small number of prize cattle and sheep. In some years as much as £1000 is paid by a rancher in the Argentine for a prize bull bred in Britain. In this way ranching has become an industry of world-wide importance, and the rancher on the prairies competes with the rancher on the pampas in supplying the European markets with beef, and the sheep-rearer of New Zealand competes with the sheep farmer of Australia and Argentina in sending excellent mutton to Britain.

Other animal produce.—Mention has been made of the wool trade. Sheep were first reared in Australia to supply Britain with wool, and, at the present time, Argentina supplies wool to France and Germany and other countries of Western Europe where woollen cloth is made.

But the rancher found that as soon as he had his cattle under greater control, there was a market for butter and cheese made

from the milk of his animals, and some ranchers began to pay attention to dairy-farming, especially in the neighbourhood of the large towns of his own country.

Consequently, Canada sends butter and cheese to Europe, and Australia and New Zealand send butter and cheese to Britain.

The influence of man upon the grass-lands.—The grass-lands have been stocked with animals by the rancher; nowadays, he divides the hitherto boundless plain with fences into separate pastures, and increases the number of his flocks and herds.

At the same time, man feels the necessity of getting his produce quickly to market, and in many places the plains have been covered with a network of railways, such as those shown in Fig. 69 in Argentina. Railways mean the



FIG. 69.—RAILWAY DEVELOPMENT ON THE PAMPAS OF ARGENTINA.

(Note the Trans-Andine Railway from Buenos Aires to Valparaiso.)

development of towns and an increase in the density of the population, and consequently, the plains are dotted with towns where men are busy with buying and selling.

Railways lead to ports, and on the coastlines of the ranching countries there are many ports where the chief business of the town is connected with the loading of the ships with their cargoes of meat and wool, butter and cheese. Oamaru, Timaru are such ports along the eastern coasts of New Zealand.

This shipping trade causes men in Western Europe to send articles to the rancher, and thus load the ships which otherwise would travel to the ranching countries empty or "in ballast."

Such a trade as this means that many of the factory hands in Western Europe are busy producing clothes, furniture, boots, pianofortes, etc., which will be purchased by the ranchers thousands of miles away.

Consequently, modern business connects the rancher with the factory hand, each depends on the other, and the demands of the factory hand for food cause the population of the plains to extend further and further away from the coasts, while the demands of the ranchers cause factory hands to congregate closer and closer together in the congested factory towns of Europe.

SUMMARY.

Ranching is the business of the men who inhabit the prairies (North America), the pampas (Argentina), the downs (Australia), the grass-lands of New Zealand. These men supply Western Europe with beef, mutton, wool, butter and cheese.

EXERCISES.

1. Out of every hundred sheep in the world the following countries contain the numbers stated :

Australia 14 ; Argentina 12 ; Russia 12 ; United States 10 ; Turkey 10 ; United Kingdom 5 ; New Zealand 4.

These facts are conveniently shown by a diagram. On a piece of squared paper a square is marked to contain 100 small squares. 14 squares are then marked off, and the name Australia is printed within the square. The other countries are similarly treated. The result is shown in Fig. 70.

State the facts you notice.

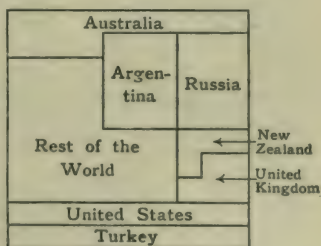


FIG. 70.—THE WORLD'S SHEEP.
(The size of the divisions indicates proportionately the number of sheep.)

2. Cattle are used for food and as beasts of burden. The cattle in India are used as beasts of burden and those in the United States are reared for food.

Out of 100 cattle in the world the proportions in various countries are as follows :

India 26 ; United States 16 ; Russia 10 ; Argentina 7.

Make a diagram to illustrate these facts.

3. Trace an outline map of the world. Insert the boundaries and names of the countries named in Exercises 1 and 2. Mark the countries which rear sheep with *S* and those which rear cattle with *C*.

4. The countries which produce wool are named below with the proportions they produce out of every 100 lbs. of wool produced :

Australia 20 ; Russia 14 ; Argentina 12 ; United States 10 ; New Zealand 6 ; United Kingdom 5.

Make a diagram to illustrate these facts.

Write a brief note to compare the facts regarding sheep and wool.

5. The countries which supply the wool used in the United Kingdom with the quantities they supply out of every 100 lbs. are shown below :

Australia 35 ; New Zealand 18 ; British South Africa 9 ; United Kingdom 16.

Make a diagram to illustrate these facts.

Write a note to compare these facts with those noted in connection with Exercises 1 and 4.

6. Beef is supplied to the United Kingdom, either as live cattle or as "chilled beef," from the following countries in parts out of every 100 lbs. consumed :

United States 13 ; Argentina 13 ; United Kingdom 61.

Illustrate these facts diagrammatically and show by arrowheads the lines of traffic on the map of Exercise 3.

7. Mutton is supplied to the United Kingdom, either as live sheep or as "frozen mutton (Canterbury lamb)," proportionally per 100 lbs. as follows :

New Zealand 16 ; Argentine 15 ; Australia 6 ; United Kingdom 63.

Illustrate these facts by a diagram and show the traffic routes by arrowheads on the map of Exercise 3.

8. "Stock farming will probably always be the most important occupation in large parts of the British Empire." State generally the position of some of the chief regions of which this is true, and explain the geographical conditions which are likely to prevent development in other directions.

(O.U.L.)

9. What are the chief sheep producing areas of the Southern Hemisphere? How far is it climate that determines them? Are their exports identical?

(L.C.C.)

15. Corn Growing on the Grass-Lands.

1. On a traced map of the world, name the following districts: Manitoba, Saskatchewan (Canada), Kansas, Minnesota, N. Dakota, Nebraska (U.S.A.), Argentina, New South Wales, Victoria, South Australia, Panjab, the United Provinces (India), Hungary, Roumania, and the black lands of Russia north of the Caspian Sea.

Your map will probably be too small for you to insert the complete name of each district; therefore, mark each district distinctly with either a single letter or a number, and show by an index to the map the full name of the district for which each letter or number stands.

These districts are the parts of the world where wheat is grown on a large scale.

2. On a traced map of the world show, by shading only, the chief wheat growing districts. Insert and name the following ports: Montreal, New York, Buenos Ayres, Adelaide, Melbourne, Sydney, Karachi, Galatz and Odessa. Write a brief note upon the nearness of these ports to the wheat growing districts. Which of the latter is nearest to its port? Supposing all these districts send wheat to London, name the three ports from which the wheat reaches London after comparatively short journeys oversea.

Early arable farming.—As soon as the nomadic rancher of early times desired to add grains as well as milk and cheese to his diet, he began to till the ground, in order to ensure a sufficient supply of grain. At first, this tillage was probably performed by the women, whose duty it still is in primitive households to prepare the food for meals.

Gradually the area of land devoted to tillage was extended until the rancher found that he had less grass-land for his animals. From that time until the present it has usually happened that arable farming, or the growing of crops, has displaced ranching, and driven the ranchers further into the grass-lands, to the districts where the rainfall is more scanty.

One important result of this devotion to tillage is the growth of settled life, first of all upon the farms, and later in villages. Men began to consider land a valuable possession, and frequently the men who lived on the plains were tillers of the ground and men who lived upon the hillsides were ranchers.

All over the world, wherever man is still in a somewhat primitive state, this division of men into tillers and ranchers occurs.

Prairie farming.—In modern times, *i.e.* within the last century, Europeans have emigrated to the great grass-lands, and the ranchers whose work was described in the last chapter have been continually pushed inland by men who began to till the ground.

These men found that the soil of the prairies and pampas, etc., would grow such crops as wheat and oats easily; they found that by sowing the seed over a large area of country they were able to reap great quantities of these cereals. Consequently, it became a habit for emigrants to occupy large areas of country and farm them for cereals.

The number of men able to reap the harvests and carry out the work of tillage generally was small, and consequently these prairie



FIG. 71.—PLOUGHING BY MACHINERY ON THE CANADIAN PRAIRIE.

farmers have been compelled to invent many new forms of machinery to enable them to do without much manual labour. There are engines which drive machines to clear the ground of occasional tree stumps, to work the ploughs, and to cut the crops and thresh the grain.

Work performed in this way by machinery is frequently not so thoroughly done as when more men are employed, but the prairie farmer is satisfied with less careful work, and hopes by tilling a large stretch of the land to obtain sufficient grain to earn a livelihood. He aims at growing so large a crop that when he has sold nearly the whole of it, he has earned sufficient money for himself and his family, as well as a surplus which he can save, or expend upon luxuries or upon improvements on his farm.

Prairie farming is only possible when land is cheap, and therefore it only occurs in those countries where there are wide open plains, which would grow grass if they were left in a state of nature.

The emigrant has been attracted to the world's grass-lands because such large areas have been given to any man who would settle upon the plains and establish a prairie farm.

The prairie farmer, like the modern rancher, works to sell his produce. He devotes his attention usually to one crop, either wheat or oats or maize (Indian corn), and his produce is generally sent long distances overseas to feed the workers of Western Europe. The prairie farmer of Canada and of the United States sends much of his wheat to Britain, and there his wheat is sold in competition with wheat from the pampas farms of Argentina, from the similar farms of Australia, and of Hungary or Russia in Europe.

Farming for export.—Prairie farming of this kind, where nearly the entire crop is exported out of the district, provides work for many people. Such farming is best carried out on those grass-lands, where there is sufficient rainfall for the growing crops during the time while they sprout and while they are green and growing, and where there is sufficient dryness during the succeeding weeks to ripen the crops, and turn them yellow, to make good straw from the stalks of the plants and to fill the ears of corn. Cereals, therefore, need rainfall during the weeks which succeed the seed-time, and sunshine and dryness during the weeks immediately preceding the harvest.

Wheat-growing in India.—In the north of India, on the plains in the valleys of the Ganges and the Indus, there is a season of rains followed by a season of sunshine and drought. It is hottest during the rainy season, the season of the summer monsoons. Usually the monsoon rains of India are very heavy; as much as 150 inches of rain may fall during the rainy season from May to September, but in the Panjab and the United Provinces the rainfall occurs during the monsoon period, but is not very heavy; consequently, wheat can be grown in these districts.

The people of India do not eat much wheat, and the crops grown in these districts are mainly intended to be exported, so that India grows wheat for export. On the other hand, since there are so many people in India, the wheat farmer does not use the labour-saving machinery which is used in the United States, where labour is scarce.

Wheat consumption in Britain.—A century ago many people in Britain did not eat much wheaten bread: their chief cereal food

was oatcake. Since that time, however, wheat bread has been eaten almost to the exclusion of oatcake, and during the century the population of Britain has increased rapidly. Consequently, at the present time, the British farmer can only grow about one-fifth of the wheat which is required by the population.

As a result of this fact, wheat growers all the world over are chiefly interested in the price of wheat in London, as they send most of their crops to Britain, and as the price of wheat in Europe depends upon the price of wheat in London.

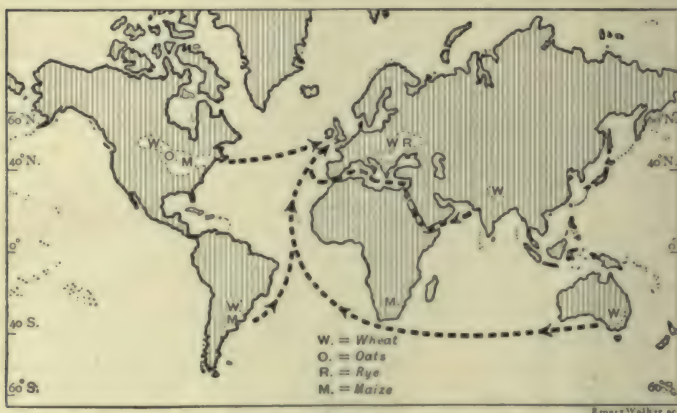


FIG. 72.—THE WORLD'S CEREAL GROWERS.

(Note that the chief areas are all approximately 40° N. or 40° S. of the equator.)

Consequently the prairie farmer, like the prairie rancher, works that he may feed the factory workers and others of Western Europe, and is profoundly interested in their needs.

Cereals.—Wheat is the chief cereal; it is most extensively grown and eaten. But oats, rye, and maize are also grown in somewhat similar fashion to wheat. Where the land is wetter and colder, both rye and oats give better crops than wheat, and maize or Indian corn is grown where it is too hot for wheat. The chief growing areas for these cereals are shown in Fig. 72.

The influence of the grass-lands upon man.—The wide extent of the grass-lands has attracted emigrants from Europe, and has reduced the pressure of population in that continent. The vastness of the land has caused the emigrants to produce large quantities of

grain and to invent suitable machinery for their needs. The necessity of marketing the crops has forced other men to build railways and to develop steamship lines, so that the prairies of Canada and the United States, the pampas of Argentina, and the downs of Australia have contributed chiefly to the progress of the people who inhabit these centres.

At the same time, the greatness of the prairies ensured for the people of Europe adequate supplies of food-stuffs, and caused them to change their diet. Wheat and meat are now the chief foods of the British, and are becoming the chief food of the continental, factory worker. The traffic in food-stuffs causes the rise of great ports in the producing and consuming countries, and gives employment to sailors, railway men and shipbuilders.

The influence of man on the grass-lands.—Man progresses by conquering nature, and the whole history of the development of the grass-lands of the world shows this conquest. First, suitable machinery enabled man to make use of these wide plains; later, man populated the grass-lands and drove therefrom the wild beasts. At the present time, for example, in Canada a new railway line is being made across the prairie, and men are hastening to take up land and make farms on both sides of this thin iron line of communication.

SUMMARY.

The prairie farmer grows wheat, oats or maize for export. In Canada, the United States, Argentina and Australia, he tills the ground to grow crops to sell to Western Europe.

His produce provides cargoes for hundreds of ships which cross the ocean annually. His needs cause railway lines and canals to be built so that his produce may be sent to the ships.

EXERCISES.

1. The countries which produce wheat—in proportions out of every 100 bushels harvested—are :

United States 21; Russia 18; India 9; Austria Hungary 7; Argentina 5; Roumania 2; United Kingdom 2.

These facts are shown diagrammatically in Fig. 73.

State the important facts you notice.

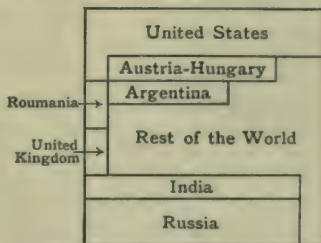


FIG. 73.—WHEAT GROWING.

(The size of each division represents the proportion of the world's wheat crop.)

2. Out of every 100 bushels of oats harvested in the world the following countries reaped the quantities specified :
Russia 26 ; United States 22 ; Austria Hungary 6 ; United Kingdom 5.
Illustrate these facts diagrammatically.
3. Trace an outline map of the world and insert the boundaries and names of the countries specified in Exercises 1 and 2. Mark the wheat-growing countries with *W* and the oat-growing countries with *O*.
4. Make a diagram to show the proportions per 100 in which the following countries grow rye :
Russia 50 ; Austria Hungary 8.
Note these countries with *R* on the map of Exercise 3.
5. Illustrate diagrammatically the percentages in which the countries specified below grow maize :
United States 76 ; Austria Hungary 5 ; Argentina 4.
Note these countries with *M* on the map of Exercise 3.
6. Of every 100 cwts. of wheat consumed in the United Kingdom the following countries contribute the amounts specified :
United States 27 ; Argentina 17 ; United Kingdom 21.
Illustrate these facts by a diagram.
Show the routes followed by arrowheads on the map of Exercise 3.
Write a brief note to specify the chief sources of the wheat and beef eaten by the people of the United Kingdom.
7. What are the chief wheat-producing regions of either the Old or New World? Point out in what month or months of the year harvest is likely to take place in each region named, and give reasons for this.
(Sc. Ed. Dept.)
8. Give some account of the wheat annually consumed in the United Kingdom, and the chief sources of supply.
(L. C. Com.)

16. Planters and Plantations.

1. On an outline map of the world mark by means of numbers, with an adequate index to the numbers : 1. West Indies, 2. Virginia, 3. S. Carolina, 4. Mississippi (U.S.A.), 5. Egypt, 6. Greece, 7. Asia Minor, 8. Bombay Province, 9. Malay Peninsula, 10. Borneo, 11. Japan, 12. China, 13. Brazil, 14. California.

Which of these places have winter rains? Which have monsoon rains? Which have a rainfall heavier than 30 inches annually?

Tree plantations.—In the regions of winter rains, such as the shore lands of the Mediterranean Sea and California, the absence of rainfall during the hot summer weather prevents the extensive growth of grasses, and limits thereby the rearing of large numbers of cattle ; milk is obtained from goats rather than from cows. Consequently, in the Mediterranean lands there are many goats and a

fair number of sheep. Mohair is obtained from the goats of Asia Minor. Consequently, the people of such lands either import their meat supplies or feed on fat or oils produced from plants rather than from animals.

It thus happens that in the Mediterranean lands the olive tree is grown extensively to supply olive oil, both as a food and for cooking: this oil takes the place of butter and cheese used in colder regions such as England. Trees, however, can thrive in a Mediterranean climate, provided they have thick-skinned fruit and thick-skinned leaves to prevent evaporation during the hot summers. Thick-skinned fruits of this kind are the orange, lemon, lime, citron, figs, and pomegranates. Consequently, these fruits are grown largely in plantations in all the regions of winter rain.

In addition to these fruits, grapes are grown in plantations (vineyards). Wine is made from the grapes of Italy, Sicily, Greece, Algeria, Spain, Australia and the Cape of Good Hope. Dried grapes, such as raisins, sultanas and currants, are sent all over the world from Spain, Greece, Italy and Asia Minor.

Plantations of fruit trees in winter rain regions provide employment for many Europeans, and their products are so valuable that olive trees are planted in the south of France, that grapes for wine-making are cultivated in France, Portugal and Germany, although these three countries are not winter rain regions, and although the growing of the grapes requires extra care in the more unsuitable climate of these countries.

Other characteristic Mediterranean products are mulberry trees—on the leaves of which silk-worms are fed—barley and wheat. These two cereals find the wet winters and hot summers suitable for their growth, and most of the varieties of wheat grown elsewhere in the world on the prairie system have been raised from original plants which were cultivated upon the shores of the Mediterranean Sea hundreds of years ago.

Plantations and man.—Plantations of this kind affect mankind in two ways: first, they do not require from men the arduous tillage of the soil which is the lot of the farmer in colder lands; and secondly, they provide him with such a wealth of fruit that men in such areas feed largely upon vegetable foods, and therefore neither produce nor trade largely in animal produce. Consequently, men who work in such plantations supply dried fruits, olive oil and silk to the rest of the world, and do not require meat and wheat in return; they, however, receive in return for their exports, imports



FIG. 74.—FARMS AND PLANTATIONS

S=sugar cane. C=cotton. R=rice. T=tobacco.
E=West European mixed farming; sugarbeets, cereals, potatoes, etc.

of clothing and such articles as machinery and household utensils which are made from metals.

In their own country such men are not hard workers: they find sustenance from the produce of their own soil, and they rarely earn large wages, so that they are not great buyers of the produce of other lands. Life is so easy that the populations are comparatively dense, and many Italians, for example, go to other parts of the world to work for wages.

In the hot countries which border the Red Sea, Italians make the best labourers in the construction of railway lines, for example. In **Argentina**, many Italians remain for several years and work upon the estancias. These are recruited during the summer—about the month of January—by summer migrants only, who work in the fields for a few months and return to Italy in time for the harvest work at home. Such Italians do not make good settlers; the ease of life in their own country tempts them home again, and they live and work in the Argentine only in order to save sufficient money for a life of comfortable idleness in their Italian villages.

Plantations in other winter rain regions differ from those in the Mediterranean region; they are worked with something of the same energy which is characteristic of the prairie farmer. Machinery is more used, and life as a rule is more arduous, since the produce of the plantation must be so excellent that it may fetch good prices in Western Europe or in the Eastern United States.



IN THE NORTHERN HEMISPHERE.

M=Mediterranean plantations.

1=Tea plantations of North-east India. 2=Rubber plantations of Malaysia.

A striking record of such energy occurs in connection with the growth of fig trees in **California**. Men found that the Californian climate resembled that of the Mediterranean; they found that figs could be grown at a profit: they determined to attempt to grow figs in California. Trees were obtained and planted, but at first they did not produce marketable figs. The planters of the Old World still retained some secrets regarding the cultivation of fig trees, which the Californians did not know. Men were therefore sent to Europe to discover this secret: they found it in a special treatment of the blossoms of the trees. They returned to California, applied their discovery to their plantations, and now California is preparing to compete with Mediterranean countries in the fig markets of the world.

Plantations of shrubs and grains.—In hotter countries than the winter rain regions, where the rainfall is heavier, and where the summer temperature is very high, there are plantations of cotton, tea, coffee, tobacco shrubs, rice and millet, both of which are grains or cereals, and rubber creepers.

Work in such plantations is unsuited to the white man, and therefore it happens that the cultivation of the plants is usually the work of natives, or of people brought from tropical countries, under the superintendence of white men. Some plantations, chiefly in India, China or Japan, are entirely owned and worked by natives.

Cotton is grown in the south-eastern parts of the United States, largely in Georgia, in Egypt and in India—in Bombay Province. In the United States, which grows about two-thirds of the world's cotton, the manual work of tending the plants is performed by negroes, who are descended from negro slaves who were taken to America from Africa during the seventeenth and eighteenth centuries: in Egypt and India the work is performed by native labourers.

Tea shrubs are grown in plantations in Ceylon, the north-east of India, in China and Japan. In India the work is usually performed by natives under white supervision.

Nowadays, four-fifths of the world's coffee is produced upon plantations in Brazil, but there are still some coffee planters in Ceylon who supervise the work of Singalese labourers.

Tobacco is extensively grown on plantations in the neighbourhood of Virginia in the United States, in India and in Borneo.

The sugar-cane is grown in plantations in the West Indies, in the East Indies, and in India, which produces one-third of the world's sugar-cane.

Rubber plantations occur in Ceylon and Malaysia, where white men superintend the production of the creepers and the harvesting of the juice or sap from the creepers, which is raw rubber when it has been hardened in the smoke from a wood fire.

Rice, like tea, is almost entirely produced upon plantations in countries with a monsoon rainfall. It is characteristic of the lowlands in the flat river valleys and at the deltas at the river mouths, while tea is characteristic of the plantations on the hillsides. Young rice grows in water, while tea shrubs must not have their roots in soil which is continuously soaked with water; so that the heavy rainfall must drain rapidly away from the growing shrubs. Rice plantations therefore occur on land which is of small area, for the amount of really flat land available for rice culture is limited. Therefore, rice land is held in small portions by native Indians, Chinese or Japanese. Each small portion is cultivated by a family, all of whom take their share in the work, and consequently rice culture differs from tea culture because the men are not workers for a white master, but tillers of their own plots of ground.

Shrub plantations and man.—All the plants which have been named in the preceding paragraph are largely cultivated by hand; they do not require the use of elaborate machinery during their growth. Consequently, successful plantations occur only where

there is a dense population, which supplies the requisite number of labourers, and causes a demand for large quantities of the rice which such people eat in the neighbourhood of the rice fields where it is grown. The settlers who first grew cotton and tobacco in the United States had, therefore, to obtain thousands of workers among the slaves brought from Africa.

Plantation labour is cheap, as the native labourers do not require large quantities of wheat and meat to eat; they subsist on small quantities of rice. Consequently, the millions of men who work in plantations to provide the world's supplies of tea, cane sugar, raw cotton, etc., only call upon the rest of the world for clothing and such machinery and ships as are required to prepare and send their crops to market.

An excellent illustration of the fact that people of this kind make small demands upon food supplies brought over the ocean occurs in regard to the feeding of the plantation labourers in the West Indies. These people require rice, which is largely supplied from India by way of London; but in recent years attempts have been made to use the wet low-lying valleys of British Guiana in order to grow sufficient rice for these people. In the south of the United States the needs of the cotton plantations has caused attempts to be made to grow rice in the flat lands of the Mississippi valley.

SUMMARY.

Plantations where white men work occur in winter rain regions. The people of the Mediterranean feed chiefly on wine, wheat and oil.

Plantations where non-white men work occur in tropical or hot countries. In such cases, cotton, coffee, tea, rubber are produced.

EXERCISES.

1. The following countries produce raw cotton in the percentages indicated: United States 62; India 19; Egypt 7. Make a diagram to illustrate these facts.

2. Tobacco is produced proportionately per cent. in the following countries as specified: United States 31; India 19; Russia 9; East Indies 6. Illustrate these facts by a diagram.

3. Cane sugar is produced per cent. in the countries named: India 29; United States Empire (which includes the Philippine Islands) 16; Java 16; Foreign West Indies 19. Illustrate these facts diagrammatically.

4. The monsoon countries produce rice proportionately per cent. as follows: India 40; China 34; Japan 11. Make a diagram to show these facts.

5. Tea is produced proportionately per cent. as follows: India 36; China 34; Ceylon 21. Show these facts by a diagram.



FIG. 75. (See Ques. 1.)

TEST PAPER.

1. Examine Figs. 75 and 76, and state in what part of the world (preferably in what country) you think each place is situated. In each case fully explain the considerations that guided you in locating the place. What industries appear to be carried on? In what ways are men in your own country interested in these industries? (*N.Z. Ed. Dept.)

2. Name the great (i) wheat, (ii) live-stock producing regions of the world. (Alb.)

3. State the geographical conditions favourable to the cultivation of the cotton plant, and compare the United States, India, and Egypt as cotton-producing countries. (C.S.C.)

4. In what parts of the world do nomadic tribes live? What circumstances have led to their adoption of this mode of life. (N.Z. Ed. Dept.).



FIG. 76. (See Ques. 1.)

Photo B. P. Skewis

17. Miners and Factory Hands.

1. Trace an outline map to show Western Europe and Eastern North America. Mark with a letter *C* the coal-fields which occur in this area (Fig. 77). Look up the index of the atlas to find the position of: (1) Pittsburgh, (2) Barrow, (3) Middlesbrough, (4) Sheffield, (5) Essen, (6) Liège. Enter these places, which are important seats of the manufacture of iron, on the map.

2. On an outline map of the world mark the gold-mining districts; and make a square diagram to illustrate the proportions in which the various countries mine gold.

Gold production (per cent.)—Transvaal 30; Australia 18; Canada 4; New Zealand 2; rest of British Empire 5 (total British Empire 59); U.S.A. 22; rest of world 19.

3. After reading this chapter make a list of the world's great coal-fields, and show for each the chief goods manufactured on or near the coal-field.

Miners.—Since miners work underground they are very little influenced by the climate of the country in which they work. The gold mining in the Australian desert at **Kalgoorlie** is carried on successfully, although food and water have to be brought for a long distance from the coast. The gold miner also carries on his



Emery Walker sc.

FIG. 77.—CHIEF MINING DISTRICTS.

work in the tundra region : in Alaska, at the Yukon goldfield, there are many gold miners, although the weather is extremely cold in winter.

Since miners use some of the rocks of which the crust of the earth is made, it is more or less an accident that any country possesses valuable mines of coal or iron ore or of the precious minerals. It is, therefore, largely a matter of chance where the miner finds deposits of minerals which pay him to work. All deposits of coal are not mined : in China, for example, there are deposits of coal of great extent, but there are not any railways to the coalfields, and so there are few coal miners in China ; for the price which could be obtained for the coal in the Chinese markets is not high enough to pay the cost of sending the coal by road from the mine to the market. In New Zealand there are valuable deposits of iron ore, but they are not mined : it would not pay the miners to work the mineral as they could not afford to sell the iron ore they mined in England, after paying the cost of sending the ore the long journey over the sea.

Gold and precious minerals are mined in out-of-the-way places, because a small amount of gold is very valuable and can be transported long distances with very slight cost.

Miners work, therefore, where there are deposits of coal, etc., provided they can find a market for their coal at a price which will pay them for their labour.

Miners consequently affect the rest of the world in two ways. First, they cause townships to spring up in barren places near the mines, where they can purchase the tools, clothes, food, etc., which they need. Secondly, they cause railway lines, canals and ships to be built for the sole purpose, in some cases, of carrying to them the goods they require, and carrying away from the mines the coal or iron ore which they obtain.

An interesting example of the way in which miners alter the world's work occurs in connection with the mining of coal in Lancashire. A hundred years ago coal was mined and sent in small quantities to Manchester and Liverpool to be used as fuel in the houses. Most of this coal was sent by means of canals which had recently been built for the express purpose of transporting coal. Then steam-engines were invented, and they came into use in the cotton factories of the district : consequently, more coal was required, and it began to be found that the canals could not supply the coal sufficiently quickly.

Steam-engines were made into locomotives, and trains were run upon railway lines : these trains caused more coal to be needed, but at the same time they made it possible for the miners to send their coal to market much more quickly. Thus it happened that the miners became much more numerous, and their work became more extensive step by step with the development of the cotton factories of Lancashire. The needs of both brought into being a large trade in iron machinery and in railway trucks and locomotives, which in their turn made the production of cotton goods and coal year by year more extensive and more valuable. Consequently, Lancashire has contained during the last century an ever increasing number of coal miners, factory hands and iron workers.



Photo Underwood & Underwood

FIG. 78.—A TRANSVAAL GOLD MINE.

(Note the single-storey buildings out on the veld.)

Gold mining.—Gold is required for coins and for ornaments : gold has always been valuable, and, therefore, for centuries gold has been mined. At the present time the largest gold producer is the **Transvaal**, chiefly from the mines at **Johannesburg** and **Pretoria**. Gold is also mined extensively in Australia, chiefly at **Kalgoorlie**, and in the United States and in the **Yukon** gold field. Most of the world's gold, in fact about three-fifths, is produced within the British Empire (Fig. 77).

Coal Mining.*—The United Kingdom produces a quarter, the United States two-fifths, and Germany one-fifth of the world's coal. No other country has many coal miners, or produces much coal.

* Since the war Germany has lost many coal mines to France, so that the disparity between the two countries will largely disappear.

France is the next country on the list, and the coal mines of North-eastern France produce only one-sixth of the coal mined in Germany. Belgium comes next. Canada, India, Japan and Australia each produce a small amount of coal, in each case about 1 per cent. of the coal produced in the world. The world's coal is mined chiefly in the neighbourhood of the three black lines shown on Fig. 77. The first line is in the United States, and is in the neighbourhood of Pittsburg in the valley of the Ohio river. The

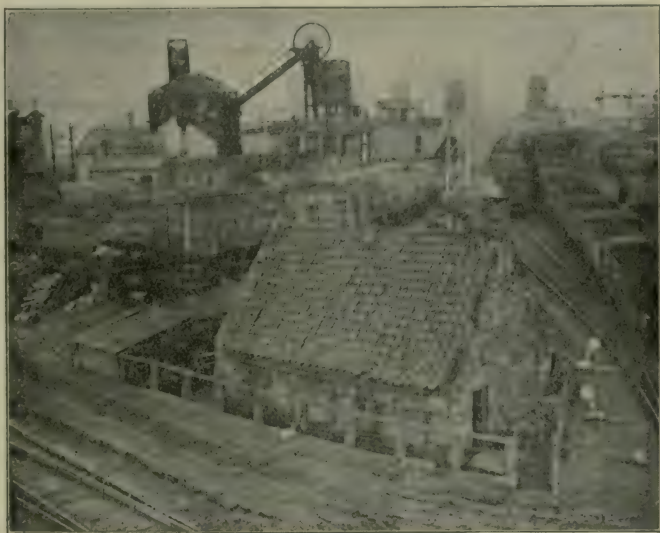


Photo Underwood & Underwood.

FIG. 79.—AN ENGLISH COAL MINE.

(Note the winding wheel and the railway trucks.)

second line is in Great Britain ; it starts in the north about half way between Glasgow and Edinburgh, runs south to Birmingham and then south-west to South Wales ; the coal fields of Britain lie on each side of this line. The third line starts in North-east France in the neighbourhood of Rouen on the Seine, passes through Belgium, near the town of Liège, crosses the Rhine and passes near to Essen in Germany, and then extends eastward.

The coal mined in the United States is used in that country and a little is sent to Canada. The German coal is used in Germany, and sent across the western boundary of the country into France ;

while coal from Britain is imported into Germany from the eastern boundary, which is the coast of the Baltic Sea. The coal of the United Kingdom is used in the United Kingdom and is sent to most of the countries which have ports upon the Atlantic Ocean, on the Mediterranean Sea and on the Baltic Sea. Some British coal is sent to Gibraltar, Malta, Aden, Mauritius, Colombo, to be used by the battleships of the British navy ; such places are known as **coaling stations**.

Although Australia and Japan mine very little coal, they have a surplus which they can send over the waters of the Pacific Ocean to other countries.

Iron mining.—Iron is required for the purposes of making steel, hardware, etc. Iron ore is mined chiefly in the United States, in Britain, in Sweden and in Spain. In the United States the great iron ore mines are near Lake Superior (Fig. 77) ; in Britain they are near Middlesbrough and Barrow in North Yorkshire and North Lancashire respectively ; in Sweden they are in the south and in Spain they are in the north, whence the ore goes to Bilbao (Fig. 77), to be carried chiefly to Britain. Iron ore is also mined in small amounts at scattered places elsewhere in Europe.

Factory hands.—In the United States, in Britain, France, Germany, etc., there occur large buildings in which there is steam-driven machinery for the purpose of manufacturing many kinds of goods. The first kind of such goods is the textile or woven articles, which are sold as cloths of cotton, wool, silk or linen.

The second kind of factories, in this case usually called works, are the metal factories, where goods of iron, steel, tin, copper, etc., are made. In these cases there are many people employed in a small space, and they live near the factories in rows of small houses which join each other and are all alike.

Consequently, factories occur in towns ; and since coal is required to drive the machinery, it usually happens that the factories and the factory towns are situated on or near the coal fields.

It has happened also that the coal fields usually contain towns where one set of factories is almost entirely used for the manufacture of goods of one kind. Mention has been made of the cotton factories of the Lancashire coal field ; the Yorkshire coal field embraces many woollen factories in the north near Leeds, and many iron works in the south near Sheffield. The Staffordshire coal fields are chiefly used for pottery works in the north and for iron works in the south. The coal field of the north-east of France and

of Belgium has caused the cotton, woollen and iron factories of those countries to be grouped together near them. The German coal field has produced the large numbers of iron and steel works massed together in the neighbourhood of Essen.

The chief factories on the coal fields elsewhere will be noted in later chapters.

SUMMARY.

Miners and factory hands live packed together in towns: *e.g.* the cotton districts of Lancashire have more than 3000 people per square mile; while the farming districts of Lincolnshire have less than 200 people per square mile.

Mines and factories cause railways and canals to be built: and cause ships to traverse the ocean highways with the regularity of railway trains.

18. Trade Routes and World Empires.

1. Fig. 81 shows the four great world empires on a map which has been arranged to represent areas correctly. Estimate the relative size of these empires and place them in order, beginning with the largest.

2. Study the great trade route through the Suez Canal (Fig. 80). Name the countries near to which a ship would steam on a voyage through the Suez Canal from London to Wellington, N.Z.

Examine the great railway line, the Trans-Siberian Railway. Name the countries through which a traveller would pass who went by this route from London to Berlin and on to Japan.

Which of these routes brings the traveller near to more important countries?

3. It is possible to journey round the world, by means of ship and train, by what is called "the all-red route": *i.e.* by travelling over sea direct from one part of the British Empire to another, and by travelling overland across no country which is not British. Write out briefly how you think such a journey would be accomplished.

Trade routes.—Because places have different climates, different vegetable and animal products come from them. Usually, each country produces more of one of these products than is needed within her boundaries; she therefore tries to sell the surplus. She must send the surplus to market, and hence railways and ships are required.

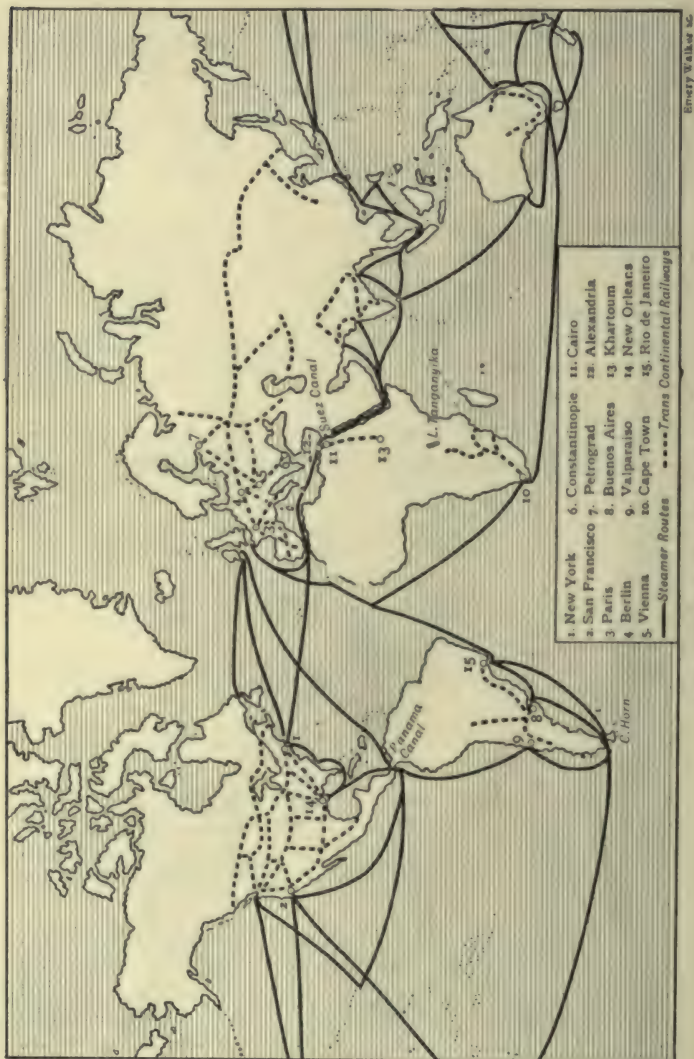


FIG. 80.—THE WORLD'S TRADE ROUTES.

In the course of the last fifty years, it has gradually happened that food stuffs and raw materials for the use of factory people are sent to Western Europe and the Eastern United States from the other countries of the world ; and manufactured goods are sent to the rest of the world from the countries which have their shores on the North Atlantic Ocean. This exchange of goods has brought about

- (i) a large number of routes for ships over the oceans ;
- (ii) a large number of long railway lines over the land ;
- (iii) the existence of large and small ship canals.

These are called the trade routes of the world.

Trans-continental railways.—North America is crossed by four great railway lines which link up New York on the east with San Francisco on the west, over 3000 miles away.

The chief cities of Europe—Paris, Berlin, Vienna, Constantinople, Madrid and Petrograd—are joined by railway lines (Fig. 80) from Petrograd a line of railway, the **Trans-Siberian Railway**, traverses Europe and Asia eastwards to the shores of the Pacific Ocean : this is the shortest route from Europe to Japan.

A line, called the **Cape to Cairo line**, is projected from the south of Africa to the north : it has been made from Cape Town almost to Lake Tanganyika and from Alexandria beyond Khartoum.

In South America a line of railway runs from Buenos Ayres on the east coast over the Andes Mountains to Valparaiso on the west coast.

Ocean routes.—From the ports of Western Europe—London, Liverpool, Hamburg and Havre—direct lines of ships go to the great ports of the world. Across the Atlantic to New York, to New Orleans and the West Indies ; further south to Rio de Janeiro and Buenos Aires and to Cape Town. Some ships from these ports go by the Cape route to Australia.

But the great highway of shipping traffic is from the Atlantic Ocean through the Straits of Gibraltar, through the Mediterranean Sea, the **Suez Canal**, the Red Sea and across the Indian Ocean to India, China, Japan, and Australia and New Zealand.

Until the Suez Canal was cut, ships went by the Cape route. At the present time, ships from Western Europe to the western ports of South America, *e.g.* Valparaiso, are compelled to make their way round Cape Horn. But the Panama Canal has been cut across the isthmus between North and South America to establish a new ocean highway, which will make the seas round the West



FIG. 81.—THE FOUR GREAT WORLD EMPIRES.

Indies more important and will shorten the voyage from New York to Valparaiso (Fig. 126.)

Smaller ship canals.—The peninsula of Jutland lies right across the entrance to the Baltic Sea ; consequently a ship canal has been made across the isthmus where this peninsula joins the mainland of Europe. This canal—the **Kaiser Wilhelm Canal**—shortens the voyage from Hull or Newcastle to Petrograd.

Manchester is the centre of the cotton factories of Lancashire. In no other single district in the world is there so dense a collection



Photo Underwood & Underwood

FIG. 82.—THE BARTON AQUEDUCT.

(The Bridgewater Canal is carried across the Manchester Ship Canal. The upper bridge can be closed like a canal lock and is moved out of the way to permit large ships to pass up the Ship Canal. Note the signal ball in the middle of the bridge.)

of factories engaged in so gigantic a trade. The cotton required for the manufacture used to be imported by ship to Liverpool, and then sent by rail to Manchester. This caused inconvenience, and a ship canal—the **Manchester Ship Canal**—was made from the estuary of the river Mersey to Manchester, so that this city is now a port.

The grain fields of Central Canada and the iron ore mines of Lake Superior cause many ships to cross Lake Superior, laden with grain or iron which must be taken eastwards. At the place where Lake Superior joins Lake Huron rapids obstructed navigation, consequently ship canals—the "**Soo**" Canals—were made, so that ships

loaded at the western end of Lake Superior might pass out of that lake into Lake Huron, and thence into Lake Erie to the port of Buffalo. Between Lakes Erie and Ontario are the Falls of Niagara, which necessitated the construction of another ship canal between these lakes.

Between Lake Ontario and Montreal the river St. Lawrence is obstructed by rapids, so that another canal system was required. Thus three ship canal systems have been necessary before ships could pass from Lake Superior to Montreal.

London the centre of the land hemisphere.—If a globe be held so that the eye is directed straight towards London, and so that the visible half of the globe has its centre at London, it will be found that the whole of the land surface of the world can be seen, except small portions of Asia, South America, and Australia. The portion of the globe which is thus visible is called the **land hemisphere**, and London is the centre of this portion of the earth's surface.

Fig. 81 is a map made to show the whole world in such a way that areas are in correct proportions, and to show the land hemisphere in the middle portion of the map. Most maps of the world as a whole distort the shapes of the continents; this map does not give much distortion of shape except in South Africa, and it should be compared with Fig. 80.

The three great empires.*—Fig. 81 indicates the extent of the British, French, and United States Empires. Only the British Empire extends into the water hemisphere, except for the small portion of the United States Empire which is composed of the Philippine Islands.

The French Empire includes a large portion of Northern Africa, and small portions of South America (French Guiana), and of Asia (French Cochin China).

Fig. 81 shows that the United States Empire includes Alaska, the north-west portion of North America.

A comparison of the areas shown in Fig. 81 indicates at once that the British Empire, which includes many small portions not marked upon the map, is the largest and most wide-spread empire of the present day.

It includes the Dominions of Canada and New Zealand, the Commonwealth of Australia, the Union of South Africa and the Empire of India. There are also the dependencies of Guiana and

* The Germans have lost their colonial possessions by the Treaty of Paris.

Honduras in Central America, Jamaica and the smaller West Indian Islands, British West Africa, British East Africa, the Sudan, the separate British parts of the Malay Peninsula.

SUMMARY.

The British Empire is the most wide-spread empire the world has ever seen.

It contains farmers, and ranchers and lumberers in its outlying dominions.

It contains the world's densest factory population in Central Britain.

The exchange of products between these groups of men has brought into being many lines of steamers which cross the ocean rapidly ; many trans-continental railway lines, such as the Canadian Pacific Railway ; and canals, such as the Suez Canal.

TEST PAPER.

1. What conditions of land surface and climate are necessary for the successful growth of (a) cotton, (b) rice, (c) sugar cane, (d) wheat, (e) oats. In what countries are they largely grown ? (N.Z. Ed. Dept.)
2. Describe the effect of mountains upon the rainfall of various localities, and give as many illustrative examples as you can. (N.Z. Ed. Dept.)
3. Explain the following statements :
 - (a) India is a land of monsoons.
 - (b) Sailing ships from England to New Zealand go out by the Cape of Good Hope, but sailing ships from New Zealand to England come back by Cape Horn.
 - (c) The days are always the same length as the nights in British Central Africa.
 - (d) Canadian apples are sold in England in our autumn and Tasmanian apples in our spring. (*C.P.)
4. A river rises in a mountain range 900 feet above sea level. At 300 feet it forms a long narrow lake, leaving which it falls into the sea. The distance of the upper end of the lake from the sea is equal to the distance of the same from the source of the river. On one side of the lake the land rises to a height of 700 feet, and on the other to 400 feet. Draw a map of the above, showing contour lines for every 100 feet. (C.P.)

TEST PAPER.

1. Fig. 83 represents a stretch of country. What is its area ? Draw a section from *A* to *B* *A* is close to the bank of a stream ; from which direction does the stream come ? In which direction is the water flowing ?

Describe the view from *D* (1020 feet) northwestwards. Are *B* and *C* visible from *D*? How long do you think it would take to walk from *A* to *B*? (C.W.B.)

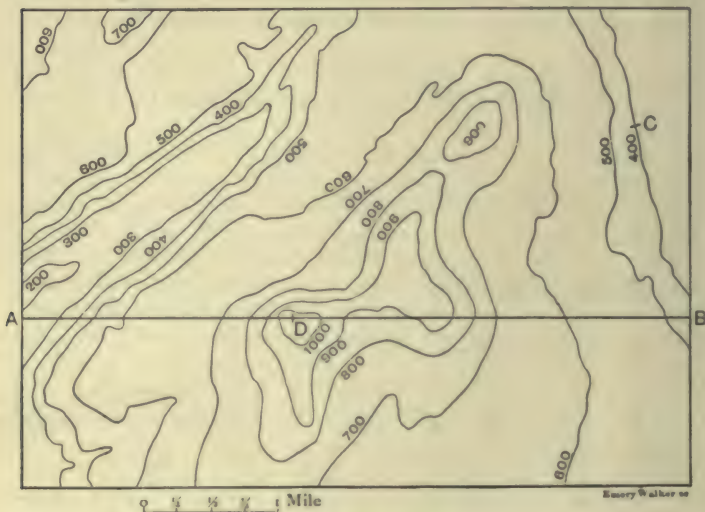


FIG. 83. (See Ques. 1.)

2. The following figures give the mean monthly temperature and rainfall for two places *A* and *B*. State to what part of the world each may belong, and give reasons. *A* is 750 ft. and *B* 90 ft. above sea-level.

<i>A</i> .	Jan.	Feb.	Mar.	Apr.	May	June	} Temp.
<i>B</i> .	52.2	52.5	54.9	59.2	65.0	71.2	
	July	Aug.	Sept.	Oct.	Nov.	Dec.	} Temp.
<i>A</i> .	65.8	62.7	53.7	40.9	21.0	5.4	
<i>B</i> .	76.5	77.0	73.8	67.1	59.4	54.0	} ° F.
	Jan.	Feb.	Mar.	Apr.	May	June	
<i>A</i> .	0.83	0.93	1.07	1.55	2.31	3.43	} Rain. in
<i>B</i> .	4.1	3.1	3.7	2.6	1.1	0.5	
	July	Aug.	Sept.	Oct.	Nov.	Dec.	} Rain. in
<i>A</i> .	3.03	2.55	2.11	1.61	1.00	0.92	
<i>B</i> .	0.2	0.6	2.0	3.8	4.0	3.8	} inches.

(C.S.C.)

3. How is the survey of a new country conducted so as to represent it on a map? (C.P.)

4. What is a ship canal? Give the names and localities of three such canals, and state the chief commercial advantages derived from them. (Pan.U.)



AUSTRALIA

English Miles



below 600 feet
600 to 3000 "
above 3000 "



PART II.

THE CONTINENTS IN DETAIL.

Memory Maps.

Outline maps for memory work.—For memory work the first consideration is the choice of an appropriate network of parallels



FIG. 85.—OUTLINE MAP OF AUSTRALIA.

and meridians. Fig. 85 shows for Australia that 130° E. makes a suitable central meridian. Measured from an atlas it is found that

10° along parallel 40° S. are about seven-eighths of the distance covered by 10° along a meridian, and that 10° along parallel 10° S. are roughly equal to 10° along a meridian. Proceed therefore as follows:

- (i) Draw the central meridian— 130° E.;
- (ii) mark four points on this line an inch apart;
- (iii) draw parallels through these points;
- (iv) mark points at distances of $1''$ along the top parallel (10° S.) and at distances $\frac{7}{8}''$ along the bottom parallel (40° S.);
- (v) join these points to make the meridians.

Learn the method of drawing the network.

Next consult an atlas and mark specially all the places where the coast cuts the network: these places are marked thickly in Fig. 85. Learn these places. Complete the coast line.

Practise this map until you can do it quickly.

SECTION I. AUSTRALASIA.

19. Size and Relief.

1. Make a map-network (Fig. 85). Practise drawing outline sketch maps of Australia with such a network until you can draw one from memory. Insert on such a map the tropic, the names of the six states and the names of the capitals, marking the position of each with a dot.



2. Insert on another sketch map all the facts you have learnt about Australia in Part I.

3. Draw a map of New Zealand (Fig. 86), and insert accurately Auckland, Napier, Wellington, Nelson, Christchurch and Dunedin.

4. Insert on a similar map of New Zealand all the facts noted about New Zealand in Part I.

Australasia.—Australasia consists of the large island of Australia and the smaller

FIG. 86.—OUTLINE MAP OF NEW ZEALAND.

islands which form the group of New Zealand. Tasmania, a comparatively small island off the south-east corner of Australia, is included in the Commonwealth of Australia. South Island, New Zealand, is a little more than twice the size of Tasmania.

Queensland, New South Wales, Victoria, South Australia, Western Australia and Tasmania were formerly separate colonies, and now form together the **Commonwealth of Australia**.

Position.—The farthest point on the earth's surface from London is Antipodes Island, which is just south of New Zealand. Tasmania lies about the same distance from the equator as South Island, N.Z., but is about a thousand miles further west. Victoria is in about the same latitude as North Island, N.Z., and the remainder of Australia lies nearer the equator than Victoria.

Size.—Australia is about thirty times the size of New Zealand; Western Australia and South Australia—including the Northern Territory—are each about one-third of Australia. Queensland is a little less than a quarter of Australia, and New South Wales is about half the size of Queensland. Victoria is about a quarter of New South Wales, about the same size as New Zealand, and about three times the size of Tasmania.

Population.—The population of Australasia is less than the total population of Greater London. Australia contains about five millions and New Zealand about one million people. New South Wales and Victoria, two of the smaller states, together contain about two-thirds of the people of Australia; New South Wales has slightly more people than Victoria, consequently there are four times as many people on the average per square mile in Victoria as there are in New South Wales.

Queensland, which is nearly seven times as large as New Zealand, contains fewer people. The population of Tasmania is about as dense as that of New Zealand. Australasia is sparsely populated.

Relief.—New Zealand is a striking contrast to Australia in the arrangement of hills and valleys, and also in the proportion of lowland, upland and mountain.

Near the west coast of South Island lie the snow-capped mountains—the **Southern Alps** (Figs. 87 and 89). This chain of mountains is not continued in North Island, where a mountain range lies near to the east coast. From the mountain tops the land slopes rapidly down on the west coast to the shores of the Tasman Sea (Fig. 84). The eastern slopes of the Southern Alps are not so steep; in the



FIG. 87.—NEW ZEALAND: RELIEF. WINDS AND RAINFALL.

(Note the Canterbury Plains (C) and compare this map with Fig. 95.)

neighbourhood of Christchurch there occur the Canterbury Plains, the largest stretch of lowland in New Zealand.

In North Island the whole of the centre of the island is occupied by the slopes of the mountains, which stretch from Mt. Egmont towards the north-east to join the other mountains towards East Cape. The shores of the Bay of Plenty are lowland, and there are lowlands in the peninsula which stretches northwards from **Auckland City**.

In Australia the mountains lie near to the south-east coast: the **Australian Alps** are not permanently snow-capped, and stretch roughly north and south across the boundary between Victoria and New South Wales. The highest peak, Kosciusko, is about one and a half miles high. Northwards the mountain range extends beyond the Queensland border in decreasing elevation. The lowland of Australia is comprised largely of the basin of the **Murray** river (Fig. 84). The shores round the Gulf of Carpentaria are low, and in the north-west of Western Australia, particularly in the basin of the Fitzroy river, there is lowland.

The extensive uplands are, therefore, the most characteristic features of Australia. Practically the whole of Western Australia and the Northern Territory is upland; the western half of South Australia and a large part of the middle of Queensland is composed of the upland which surrounds the Murray Basin. Tasmania resembles North Island, N.Z., as it consists largely of upland.

Rivers and water supply.—New Zealand has very many rivers: in no part of the Dominion can a traveller fail to find a stream within a mile or so. There are also many large lakes: *e.g.* Lake **Taupo** in N. Island and Lake **Wakatipu** in S. Island.

Australia, on the contrary, has comparatively few rivers. The great river system of the **Murray-Darling** (Fig. 84) waters most of New South Wales, but in seasons of drought these rivers contain very little water. Round the coast other rivers find their way seawards, the chief of these are the **Flinders**, **Fitzroy** and **Ashburton**. In the interior there occurs Lake **Eyre**, into which flows several streams, and from which there is no outlet to the sea. The water supply of Australia is, therefore, scanty, and near **Mildura**, on the Murray, fruit growers find that water has to be carried considerable distances in artificial channels for their crops. The supply of water artificially by such methods is called **irrigation**. Comparatively large areas in Victoria must be irrigated.

SUMMARY.

<i>Australia.</i>	<i>New Zealand.</i>
Lat. 10° S.— 40° S.	34° — 47° S.
Size: Twenty-five times British Isles.	Size: Five-sixths British Isles.
Plateau, with lowland in river valleys and steep slopes to the sea from the Australian Alps.	Mountain ranges, with short steep slopes on one side and longer gentler slopes on the other.
Comparatively few rivers; subject to drought.	Many rivers; subject to floods.

EXERCISE.

1. Examine carefully the picture (Fig. 89) and explain as fully as you can what geographical facts may be learned from it. (*N.Z. Ed. Dept.)

20. People and Towns.

1. Write a short account, about 100 words in length, to describe what you know about farming in Australasia, as noted in Part I. (pp. 104-116).
2. On an outline map of Australia locate the position and names of all the towns marked on the map (Fig. 90). Describe what you notice about the situation of these towns.

Natives.—New Zealand is in contrast with Australia in reference to the aboriginal or native races. The **Maori**, or natives of New Zealand, are among the most intelligent native peoples of the Southern Hemisphere: on the other hand, the **Aborigines** of Australia are among the least intelligent of the native races of the world. Many Maori live on lands which have been reserved for them by the New Zealand Government; they have schools, and some of the Maori live and work among the New Zealanders. Their native houses differ from those of many aboriginal peoples, because they are frequently built with right-angled corners. The Australian native erects for himself a simple shelter made from the branches and leaves of the trees; he has scarcely learnt the rudiments of house building. He cannot even plait a circular house like the natives of Africa. The Maori has progressed so far that he cultivates the ground, and can build boats for fishing. The aborigines have not developed any knowledge of tilling the ground; they are still hunters. All the Australasian natives tend to die out; the Maori are declining in numbers, the aborigines of the mainland of Australia have

rapidly decreased, and the Tasmanian aborigines, who belonged to a different race, have died out completely.

Colonists.—The greater number of the white people who live in Australasia are emigrants or the descendants of emigrants from Britain. At the present time many thousands of emigrants annually leave the British Isles for Australia or New Zealand to begin a new life on the land in these countries. They sometimes find a difficulty in obtaining passages on the ships, for they are so numerous.

Their destination is "the Bush," which is the name given to the inland parts of the country; many of them serve on farms for a year, and then start farming on their own account. They clear the land of the native trees and bushes, cultivate a portion of the clearing, fence it in, and stock it with sheep and cattle. Australasia is, therefore, to a large extent a farmer's country.

Miners.—Over sixty years ago there was a great rush of emigrants to Australia from all parts of the world. Nowadays, the emigrant usually takes his family and intends to make his home in the Antipodes: at that time, the emigrants were nearly all men; they were gold-diggers who had but one idea, to get rich quickly. Since then there have been gold-miners always at work in Australasia.

In the early days the gold-seeker washed the sand from the sea-shore, or the mud from the bottom of the rivers, in a trough called a cradle: the heavy grains of gold sank to the bottom of the cradle and were then collected. Gold found in this way is called alluvial gold, and, at the present time, there is very little alluvial gold left. In New Zealand only the patient Chinaman goes prospecting for



FIG. 88.—AN AUSTRALIAN ABORIGINE.

alluvial gold in the streams in South Island. A modern gold mine resembles a modern coal mine, and is generally owned by a company, the miners are usually paid wages, and the mine contains much expensive machinery which is necessary to extract the gold from the rock where it occurs.

Of late years there have been discoveries of other ores, such as silver, copper and tin ores, especially in Australia ; and in the two Colonies coal is mined, both for the use of the colonists and for the use of the steamships which trade to their shores.



Photo A. Bart

FIG. 89.—A NEW ZEALAND STATION, NEAR NELSON, SOUTH ISLAND.

(Note the snow capped mountains; the northern end of the Southern Alps.)

Australasia may thus be described as the home of farmers and miners.

Towns.—Farming scatters people over the land. A sheep-rearer in the New Zealand bush lives on a station, such as that shown in Fig. 89. He has no near neighbours, and is often some miles from the nearest railway station. Frequently he has one advantage, which is not usually enjoyed by the farmer in England ; he has a telephone, by means of which he can communicate with his friends and with the nearest town.

Mining collects men together, and usually a mine causes the rise of a town or village in its immediate neighbourhood. The town contains the shops, where the miner can obtain the necessities of

life, since all the things which he needs he must buy. Consequently, many of the interior towns of Australia are mining towns (Fig. 90).

The Australian or New Zealander works for the rest of the world. He knows that the produce of his mine or of his fields is mainly intended for export to other lands, and therefore both countries have many ports. These are shown along the coasts in Figs. 90 and 96.



FIG. 90.—AUSTRALIAN RAILWAYS.

(The numbers refer to mining towns and ports; for their names see Fig. 84.)

(The proposed railway east of 3 is now made)

These ports are of two kinds; small ports scattered here and there along the coast where ships can be loaded with a full cargo of meat or wool or wheat, and large ports to which the ships from overseas come laden with miscellaneous cargoes of all kinds of manufactured goods.

The ports contain business men, whose work it is to arrange that the ships should sail at the right time with a full load. There are also traders who obtain manufactured goods from the large ports by rail and retail them to the farmers.

But Australasia does not rely entirely upon other countries for manufactured goods. In the large towns, such as Sydney, Melbourne and Wellington, there are many factories where boots and shoes, furniture and articles of clothing are made. There are also engineering and other workshops.

Consequently, in addition to the farmers and the miners there are merchants, traders, manufacturers and engineers, who chiefly inhabit the towns.

The towns are sometimes very large. For example, Sydney and Melbourne are each about as large as Birmingham in England, and contain over half a million people; so that one of every five Australians lives in either Sydney or Melbourne.

Auckland, the largest town in New Zealand, is about as large as Walsall in England, a town situated to the north-east of Birmingham and about one-fifth as large. Three out of every ten New Zealanders live in either Auckland, Wellington, Christchurch or Dunedin.

As soon as people gather together into towns in this way, it is necessary to have near them market gardens and dairy farms in order to provide them with fresh food. Consequently there are market gardeners and dairy farmers in Australasia. In addition, both Colonies send butter and cheese to Britain, and this means that some of the dairy farmers work on a large scale.

Distribution of the population.—Near the coast on the east, especially in the neighbourhood of the four capitals, Adelaide, Melbourne, Sydney and Brisbane, the population of Australia is dense, elsewhere the people are scattered. In New Zealand there is a similar grouping of the people in the neighbourhood of the largest towns, and nearly all the towns, both large and small, are either on the coast or strung like beads on the railway lines (Fig. 96).

SUMMARY.

Among the white colonists who farm or mine or trade in New Zealand live the intelligent Maoris, but in Australia the aborigines live apart from the white man. The colonists who take up farms in Australia find the land almost ready for occupation, but in New Zealand they have to clear away the trees. Many people live in the towns such as Melbourne or Wellington.

EXERCISES.

1. Compare the Maoris with the aborigines of Australia, or with the Eskimos, noting particularly such points as colour, dwellings, food and dress. (N.Z. Ed. Dept.)

2. Draw a map of the coast of Australia, from Cape Byron to Fremantle (*vid* Port Darwin), showing the position of (i) the principal ports and rivers, and (ii) the coastal and inland railway termini. (N.S.W. Ed. Dept.)

21. Climate.

1. On an outline map of Australia mark (i) the tropics, (ii) the trade winds, (iii) the roaring forties, (iv) the desert, (v) the summer rains, (vi) the winter rains.

2. On an outline map of New Zealand mark the Southern Alps, the trade winds, and shade the wet slopes of the Alps on the west as a region of heavy rainfall.

Winds.—Man's life and work are dependent very largely upon the kinds of winds which blow over the country in which he lives. In making records of the winds which blow most regularly over the earth's surface, use is made of sailor's records, as in Fig. 81.

Fig. 43 shows the wind directions for Australia. On the east coast the trade winds blow on-shore, and the eastern slopes of the Great Dividing Range have a rainfall which is over 40 inches near the seashore, and gradually decreases inland. The trade wind leaves the west coast and blows out to sea, and there is very little rainfall on the west.

On the north coast the wind is on-shore only during the hot months, so that the heavy rainfall of more than 40 inches annually occurs during the summer, and thus Northern Australia has monsoon summer rains (p. 84).

In Tasmania and along the south coast the winds are on-shore only in the winter, and therefore the rainfall is not so heavy as in the north, and is winter rainfall (p. 67).

Fig. 91 shows the temperatures and wind directions at 9 a.m. on a typical winter day. On-shore winds are blowing along the southern coast, and rain has fallen in Western Australia, Victoria and New South Wales.

New Zealand lies in about the latitude of Victoria and Tasmania, and therefore the "roaring forties" blow from Tasmania to South Island. The mountains of South Island are near the west coast,

and consequently the whole province of Westland has regular or constant rainfall, which is frequently over 100 inches per annum. Westland is thus one of the wettest districts in the world: it is as wet as the Western Ghats or the Assam district in India, and more than twice as wet as the wet parts of Australia.

Across the Southern Alps from Westland in the province of Canterbury are the driest regions of New Zealand; the dryness is partly due to the Föhn effect (p. 68). In the south in Otago there is



FIG. 91.—A TYPICAL DAILY WEATHER REPORT: AUSTRALIA.

Wind conditions and consequent rainfall on a winter day.

a small desert region, and from Christchurch to the Southern Alps the rainfall is about 30 inches a year. Because there are no very high mountains in North Island there are no districts so wet as Westland, and no districts so dry as Otago; the rainfall everywhere is about 40 inches per annum.

On the whole New Zealand is wetter than Australia; it does not suffer from droughts, which occur in Australia about once every eleven years.

Temperature.—In Northern Australia the temperature of the air is above 70° F. on the average: in Southern Australia the temperature

averages about 55°F . Yearly temperatures in New Zealand are about 55°F . On the coastal margins of Australia the temperatures in summer and winter, *i.e.* in January and July, are about 10°F ., and in New Zealand about 8°F ., above or below the average temperatures for the year.

Figs. 54 and 156 (pp. 75, 281) show that the air temperatures in the British Isles are 40°F . in the winter and 60°F . in the summer; which means that the average temperature of the year is about 50°F . New Zealand resembles the British Isles, because there is not much difference between winter and summer. In both

cases, the sea moderates the temperature of the air—warms it in winter and cools it in summer.

Continental and insular climates.—New Zealand therefore has very slight variations in climate during the changes of the seasons. It is perhaps the best example in the world of the steadying influence of the sea upon climate changes. Climates of this kind are called **insular** climates, since they usually occur in islands.

The climates of Central Australia, with the comparative absence of rain and the great variations in temperature, are typical of what are called **continental** climates.

Effect of climate on man.—It is difficult for men to farm where the temperature is very high, or where there is only a small rainfall. Consequently, much of Australia is not fitted for farm work. The farmer, however, may work almost anywhere in New Zealand except in the very wet forested districts near the west coast.

On the other hand, all parts of Australasia are sufficiently warm for farm work to be carried on throughout the year. It is never so cold in the winter that the ground is hard frozen and cannot be tilled, and the air is never so cold that cattle and sheep must be housed to protect them from the frosty air. The only seasonal effect of the climate on the farm work occurs in New Zealand, where, on some of the high lands, sheep are pastured during the summer, but

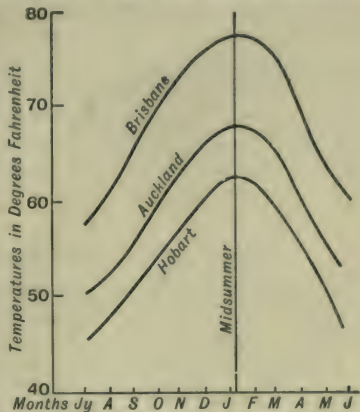


FIG. 92.—TEMPERATURE CHANGES.

are brought down to the lower and warmer lands during the winter when their summer pastures are snow covered.

The climate in Australasia is sufficiently warm all the year round for the houses to be built in rather an open fashion, with verandahs to create a shade from the summer sunshine, but with many doors and windows, so that the cool breezes may find a passage through the buildings. In the North of Australia men find that the greatest climatic hindrance to work occurs during the great heat of summer. In New Zealand the greatest climatic hindrance occurs during the heavy rains of the wetter seasons.

SUMMARY.

Interior Australia is dry and desert like the Sahara. The coastlands are wet. The air is usually warm, and is very hot in the deserts and arid regions. New Zealand is cooler and wetter.

The farmer can work everywhere in New Zealand, but Central Australia is too hot and dry, and Northern Australia is too hot for successful farming.

EXERCISES.

1. Of the ten towns named below :

- (i) Which is the hottest and which the coolest all the year round ?
- (ii) Which has the greatest difference between winter and summer temperatures ?
- (iii) Which is the wettest and which the driest ?

PLACE.	TEMPERATURES.			SEASONAL RAINFALL.				Total annual rainfall in inches.
	Annual.	January	July	Winter.	Spring.	Summer.	Autumn.	
		above annual.	below annual.	June. July. Aug.	Sept. Oct. Nov.	Dec. Jan. Feb.	Mar. Apr. May.	
	Degrees Fahrenheit.			Percentages.				
Brisbane, -	69	8	11	14	18	41	27	48
Sydney, -	63	9	11	27	18	22	33	49
Melbourne, -	58	8	9	23	28	23	26	26
Adelaide, -	63	11	11	39	22	11	28	20
Perth, -	64	10	9	55	18	4	23	33
Hobart, -	54	8	8	26	29	22	23	24
Auckland, -	59	8	7	33	24	20	23	42
Wellington, -	55	8	7	30	23	22	25	49
Lincoln, -	53	9	10	29	23	21	27	25
Dunedin, -	50	8	9	27	23	25	25	36

2. Make rainfall graphs (see p. 65) for Brisbane, Perth, and Dunedin.
Which place has summer, which winter, and which has constant rains?
Which place is most like Adelaide, and which is most like Dunedin in its rainfall?
3. Divide Australia into climatic regions, and give reasons for selecting the divisions you make. (L. U.)
4. Draw a map of Australia or New Zealand, naming the deserts and shading the area of heavy rainfall. Account for the positions of the deserts and of the rainy regions. (*Sc. Ed. Dept.)

22. Natural Vegetation Regions: Products.

1. As you read this chapter mark on outline maps of Australia and New Zealand, the forests, grass lands, etc., mentioned.

Tropical forest.—The heavy rains of North-east Queensland—due to the on-shore winds from the Pacific Ocean, together with the great heat of Queensland within the tropics—produce dense growths of trees near the coast (Fig. 62).

Other forest.—On the wet coastal slopes to the east of the Australian mountains, and to the west of the Southern Alps of New Zealand, there are other forests, which are locally known as the **bush**. These forests are not so dense as those of Queensland, and the trees are suited to the colder temperature.

On the upper slopes of the mountains the forests thin out, and tend to give place to grass lands, which are of use as summer pastures. In New Zealand, for example, the forest limit occurs at an elevation of about 3000 feet

Snow regions.—On the Southern Alps, N.Z., at a still higher elevation, occur widely scattered dwarf trees; these gradually disappear with an increase in height until the level of perpetual snow is reached. The mountain tops are characterised by peaks, which rise from more or less level ground covered with snow fields. From the lower ends of these fields, the snow which has been pressed into ice flows downwards as glaciers (Fig. 29). The torrential rivers of the Westland district of South Island, as well as the rivers which reach the Pacific Ocean over the low-lying Canterbury plains, are fed by water from these glaciers.

In the south of South Island are many lakes, such as Lake Wakatipu. These are sometimes forested on their shores, but they are overlooked by the snow-capped ridges of the mountains.

Grass lands.—In Australia, from the edges of the forest land, stretch vast upland plains of gently undulating grass land. There is not sufficient rain for the growth of trees. These plains are called the **Downs**. In New Zealand, the Canterbury plains alone are natural grass lands of this kind. There are, however, extensive tracts of pasture land in New Zealand which are the results of the activities of the settlers, who have cleared the ground by felling the trees and burning the fallen tree trunks (Fig. 93). Grass is grown from English grass seed sown by the settlers.



FIG. 93.—A NEW ZEALAND CLEARING IN PROGRESS. Photo A. Burt
(Note the snow-capped mountains and the stumps of trees.)

Deserts.—Inland from the grass lands, where the rainfall is less than 10 inches per annum, there is comparatively no growth of plants. In Australia, this barren country forms the **Central Australian Desert**, which includes a very large proportion of the interior of the continent. In New Zealand, in the neighbourhood of the lakes of Otago, there is a similar desert region of slight rainfall. This barren region is only small in size, since South Island is so narrow that no part of it is further than about sixty miles from the nearest sea-coast. New Zealand forms a great contrast with Australia in its forests, its snow-fields, its artificial grass lands, and its small desert.

Deserts and man.—The lack of water in the desert lands of Australasia has prevented the colonists from making any kind of

settlements, except for mining. In Western Australia, at Kalgoorlie, the gold mines have been so productive that men have been able to provide large sums of money with which to pay for a constant water supply, which is carried across hundreds of miles of desert by a line of pipes from supplies near the south coast.

Forests and man.—The early houses of the settlers are made of wood cut in the nearest forest land. Where the lands have been fenced, timber for the fencing poles is usually cut locally. Except for this purpose the forest is a nuisance to the settler, especially in New Zealand, and he destroys it. The forests of the upper slopes of the hills and mountains provide some work for the lumberer. In Australasia lumberers cut the trees, and the timber is sent by them to the large towns for wood paving, house building, etc. The Australian eucalyptus or **gum-tree** is chiefly used for this purpose, and with jarrah wood forms an article of export. The **kauri pine** of New Zealand has long been famous. Many years ago the sailing vessels which frequented the South Pacific called at North Island for trunks of this tree, which were made into masts for their ships. This practice led to an extensive trade in kauri pine, which is still an important New Zealand export.

This tree grows only in North Island, and the settlers have ruthlessly destroyed many acres of fine trees. The sites of old forests yield kauri gum, which is dug from the soil. Many men wander over this region, in the collecting stage of industry (p. 8), and live a nomadic life, dependent upon their luck in finding hidden stores of gum.

Forest land in New Zealand frequently contains marshes, where stagnant water lies. Near these marshes grows a shrub, the phormium plant, which is cut for the sake of its fibre, called **New Zealand flax**, used for making ropes, etc., and largely exported. The trade has so developed that some men cultivate this plant, and procure a supply of an improved quality. Any such cultivation induces the growth of villages or settlements in the otherwise sparsely peopled forest districts.

Fruit trees.—On account of the heat and moisture of Queensland, banana trees are cultivated. Because the climate of the east coast of Australia resembles that of Spain and Florida men cultivate orange trees. Because Victoria is a winter-rain region, men produce lemons, grapes, apricots, etc., as they do in the Mediterranean countries; and Australian wine is sold in London.

Because Tasmania is damper and colder than the rest of the continent, men grow apples, and send some to feed Londoners. Fruit for local consumption is also grown in New Zealand.

Men on the grass lands.—Men live on the Australasian grass lands in isolated farms or stations. Most of them make use of the grass lands in the manner of the prairies (p. 106). The closeness of the farms together depends almost entirely upon the nature of the



FIG. 94.—WHEAT GROWING IN AUSTRALIA.

work which the men do. Near the large towns the farmer is chiefly occupied in providing eatables for the town-dwellers. He supplies the towns with vegetables, milk, meat and butter. On the whole his farm resembles the mixed farms of England. Some of the farms—even near the towns—are dairy farms; here the farmer produces butter and cheese for export to England.

Away from the towns the farms are larger in size and the home-steads are farther away from each other. First come the "prairie" wheat farms, which usually occur in districts where the rainfall is not much more and not much less than 20 inches annually.

Elsewhere, it is either too dry or too wet to grow wheat in large quantities without a great deal of trouble. Consequently, wheat farms occur on the western slopes of the Australian mountains in New South Wales, and on the Canterbury plains of New Zealand. In South Australia, the wheat farms occur near the coast in the south-east corner, where the rainfall is greater than 15 inches per annum (Fig. 94).

These circumstances explain why Australia grows eleven times as much **wheat** as New Zealand, and why New South Wales, Victoria and South Australia grow nearly all the wheat of Australia in almost equal proportions. The Australasian wheat farmer, like the wheat farmer all the world over, is profoundly interested in the crops of wheat which occur throughout the world ; for on the prices at which wheat is sold in the markets of London, Hamburg and Chicago, depends his prosperity. When there is a shortage in the wheat crop elsewhere and prices are high, the Australian farmer has a successful year, providing the rainfall in Australia has been sufficient to grow a good crop. The Australian farmer has one advantage—he reaps his wheat crop in the early part of the year, when the farmer in North America is sowing his seed, and his exports reach England when the supply of wheat is low. The wheat farmer in New Zealand usually grows wheat for his fellow colonists only ; unless there has been a poor crop in Australia he cannot get a sufficiently high price to pay for the trouble of exporting his harvest.

Some farmers in the cooler parts of Australia grow **oats**, and others in the warmer parts are able to grow **maize**. Consequently, Victoria grows three-fifths of the oats of Australia, and Tasmania grows nearly half the rest : New South Wales grows three-fifths of the maize, and Queensland provides almost the whole of the remainder.

New Zealand grows more oats than Australia, but little maize. Both these cereal crops are chiefly grown for local consumption.

Cattle are reared on the dairy farms. In Australia, nearly one-third of the cattle are in Queensland ; New South Wales and Victoria both contain smaller numbers, while the whole Commonwealth contains five times as many cattle as New Zealand.

The chief farming work of Australasia, however, is **sheep** rearing, for the purpose of supplying both mutton and wool to Europe.

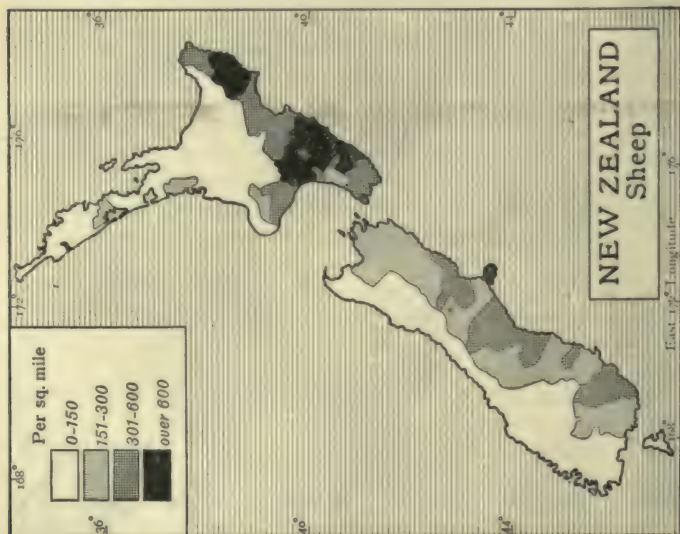
Half the sheep of Australia are in New South Wales, which contains three times as many sheep as either Queensland or Victoria.



Emery Walker &c.

FIG. 96.

(Look up the direction of the railway lines, Fig. 87.)



Emery Walker &c.

FIG. 95.

(Compare this map with Fig. 87.)

New Zealand has one sheep to every four sheep in the Commonwealth.*

Sheep-rearing is the chief industry of New Zealand: the flocks are very dense, in the neighbourhood of Wellington there are New Zealand counties which have more than a thousand sheep on each square mile of their area. Fig. 95 shows that the sheep are most numerous in the east coast districts. Fig. 96 indicates how the people are congregated near the sheep stations; the townships of at least 500 people are along the railway lines (Fig. 87) so that the distribution of the sheep governs the distribution of the people and the direction of the railways.

SUMMARY.

The natural regions of Australia are the forests, the grass lands and the desert. New Zealand is naturally forest.

Australia grows a surplus of wheat which is sent to England; while New Zealand grows only sufficient wheat on the Canterbury plains for her own needs.

The native trees, the eucalyptus and the kauri pine, are useful to man, and are exported.

The chief farming work of Australasia is ranching.

23. Products (*continued*).

On an outline map of Australia mark the mining towns from Fig. 90 and your atlas, and write against each town the name of the chief metal produced, using the following list:

Gold—Lachlan (N.S.W.), Ballarat, Bendigo, Gippsland (V.), Charters Towers, Mt. Morgan (Q.), Kalgoorlie (W.A.). *Silver and Lead*—Broken Hill (N.S.W.), Zeehan (T.). *Tin*—Mt. Bischoff (T.), Herberton (Q.). *Coal*—Newcastle (N.S.W.).

Animal products.—Most of the **sheep** in Australia, and a large number of those in New Zealand, are reared to provide **wool** for export to Europe and America.

Australia, with four times as many sheep, produces three and a half times as much wool as New Zealand. New South Wales produces four-sevenths of the Australian wool, the shares of Victoria and Queensland being about a quarter of this amount.

* In all the comparisons between Australia and New Zealand it should be remembered that the people of Australia are roughly five times as numerous as those of New Zealand.

Cattle are reared for dairying purposes ; quantities of both butter and cheese are made for local use and to send abroad. Frequently, the farmers take their milk to a co-operative creamery, where the butter and cheese are made. Each farmer receives a share in the proceeds from the sale of these articles in accordance with the quantity and quality of the milk which he has supplied.

New-South Wales and Victoria each produce about one-third of the respective quantities of butter and cheese made. Australia makes three times as much butter as New Zealand, but only about two-thirds of the quantity of cheese.

Miners.—Many people in Australasia work in the mines, and obtain coal, and ores of gold, silver, lead and tin.

The most valuable mining is for gold, as Australasia provides about one-fifth of the world's supply of gold.

The chief Australian mines are in the Kalgoorlie district of Western Australia, where more than half the gold is obtained.

In Victoria and Queensland the gold production is about one-fifth of that of the Commonwealth. The mines in New Zealand occur in the south of South Island, in the valley of the Clutha, in Otago, and in North Island near Waihi. The total production is about two-thirds of the production of Queensland.

Most of the silver and lead miners are at work in the neighbourhood of Broken Hill in New South Wales, where more than four-fifths of the Australian produce of these metals is obtained.

Tasmania produces, in the neighbourhood of Mt. Bischoff, the larger share of tin.

Coal is mined at Newcastle, in New South Wales, so extensively that this district is responsible for the production of about one per cent. of the world's supply of coal. New Zealand coal is mined on the west coast of South Island near Westport and Greymouth, and the total produced is one-fifth of that mined in Australia.

The **railways** shown in Fig. 90, and the railways of New Zealand which run almost the whole distance along the eastern coast of South Island and across North Island from Wellington to Auckland burn coal which is mined locally. Some of the coal finds its way into the bunkers of ships which trade to Australasian ports, and the transport and handling of this coal finds work for other men than the actual miners.

Local trade.—Since there are railway connections only between certain towns of Australia (Fig. 90) communication is often made

by means of coasting vessels, which carry both passengers and goods.

Similarly, in New Zealand, coasting vessels ply all along the coasts, and collect passengers and goods to go to the chief towns. Flocks of living sheep are also conveyed to the ports where they are killed and where the carcasses are frozen before they are sent to England. The chief characteristic of this coasting trade is the transport of small quantities of goods of very many kinds from place to place. Such distribution trade provides work for the merchants and traders of the large towns, who obtain goods in large quantities from Europe.

There must be a certain amount of similar local trade from the ports to the inland towns by means of the railways.

Although Australia is a farmer's country, it is not possible—on account of the varieties of climate—for each State to produce sufficient food stuffs of all kinds for the needs of its own people. Consequently there is a certain amount of inter-State, or local, trade in wheat and other cereals as well as in fruits. Queensland is too hot, and Tasmania is too wet, to grow wheat extensively ; they both rely upon South Australia to send them supplies of wheat and wheaten flour. Tasmania and Victoria are most suited for the growing of oats ; consequently they send large quantities of oats to Queensland and Western Australia.

Queensland supplies maize to New South Wales.

Particular examples of local traffic occur in connection with sheep farming. Sheep are moved in flocks across the interior grass lands by well-known stock routes from one grazing district to another. These routes lie through the country where the rainfall is scanty, and the sheep are supplied with water from underground sources. In large parts of both Queensland and New South Wales deep holes are bored through the rocks which underlie the soil, to tap water to make artesian wells.

Much of this traffic in sheep would be impossible but for these wells. Australian rivers are not greatly used for traffic, but there is some trade by paddle-wheel boats along the Murray river and along the Murrumbidgee and Darling during the flood season.

SUMMARY.



FIGS. 97 AND 98.—SUMMARY MAPS: AUSTRALIA AND NEW ZEALAND.

(F = Forest; G = Grass land; S = Sheep rearing districts; C = Cattle rearing districts; □ = Gold mines; x = Coal mines; • = Silver mines; I = Irrigated districts.)

EXERCISES.

1. Write a note on Australia, describing its climate and surface features, and mentioning the leading industries. (*Ont. Sch.)
2. Where are gold and coal found in Australasia? Name and state the position of two towns in each case which have become important because of gold and coal mining. (*L.U.)

24. Trade.

1. On an outline map of Australia mark the ports for the trade mentioned on pp. 161 to 163; add arrowheads to show the direction of the trade; and mark by means of words the articles in which the trade consists.
2. Repeat the last exercise for New Zealand.

Trade in general.—The trade of Australasia is best examined in three parts:

First, the trade which passes between the Commonwealth of Australia and the Dominion of New Zealand.

Secondly, the trade which Australasia has with the lands which fringe the shores of the Indian and Pacific Oceans.

Thirdly, the trade which passes from Australasia into the North Atlantic Ocean, to the countries of Western Europe and of North America.

In connection with the third part of this trade must be considered that with the countries which the ships pass en route, *e.g.* the countries which border the Mediterranean.

Trade between Australia and New Zealand.—The exports of New Zealand from the collecting industries are flax, timber, coal and gold. Victoria and New South Wales receive the gold and the flax; the same States and South Australia receive the timber, and some coal is sent from New Zealand to New South Wales.

The farm produce exported from New Zealand to Australia consists of preserved milk sent to Victoria and Tasmania; preserved fish sent to Queensland, New South Wales and Victoria; and bacon sent to South Australia and New South Wales.

Australian produce which is sent to New Zealand consists of flour from Victoria and New South Wales; raisins from Victoria; apples, pears and plums from Victoria, New South Wales and Tasmania; and lemons from Victoria and New South Wales.

Australian re-exports to New Zealand are chiefly coffee and rice. Most of the articles in which this "short-distance trade" occurs are such that the amounts sent to other parts of the world are less than the amounts sent across the Tasman Sea. The total trade from Australia to New Zealand is only about one-thirtieth of the total trade of Australia, so that the earnings of this short-distance trade are comparatively small.

Australian trade across the Pacific and Indian Oceans.—Australia sends all her sandalwood across the neighbouring oceans, chiefly to China and Hong Kong for the use of the Chinese. Similarly, little Australian coal is sent outside these oceans. Most Pacific countries, especially Chile, buy Australian coal.

India receives much of the timber, and China and India receive copper from Australia, for the use in the native manufacture of copper ware.

Food stuffs are chiefly sent in this district to British South Africa; both Natal and the Cape of Good Hope receive butter, flour, meat and wheat. Beef is sent to the Philippines; Java and Hong Kong receive flour and butter. Except in the case of beef, most of the Australian exports of food stuffs are sent out of these oceans to the North Atlantic.

Australian imports are coffee, chiefly from India, tea from Ceylon and India, and rice from Hong Kong and Java. All the supplies of these articles are drawn from countries round these oceans.

New Zealand trade across the Indian and Pacific Oceans.—New Zealand sends food stuffs to the South Sea Islands and Fiji, and receives in exchange bananas and other fresh fruit, as well as cane sugar. Preserved milk is sent to British Columbia; and fresh fruits, such as apples and lemons, are received in New Zealand from California. Rice is obtained from Singapore and Japan, and tea from Ceylon and India.

Pacific and Indian Ocean trade in general.—Australasia represents, in the area of which these large oceans are the centre, one of the chief sources of supply of goods which are produced in temperate countries. The general conclusion to be drawn is that the produce of tropical countries will be sent across these oceans to supply the needs of the increasing numbers of Australians, who will send in exchange increasing quantities of food stuffs, such as wheat and meat, and will in the years to come send some of the woollen and iron manufactures which Australasians hope to make in the future to supply not only their own needs but the needs of India and China.

Australasian trade with the countries of the North Atlantic Basin.—The British Isles, France, Germany, Belgium and the United States receive large quantities of goods from the rest of the world, and send in return large quantities of manufactured articles to the other countries of the world. A great deal of this trade occurs with countries which form part of the British Empire. Until a few years ago most of the articles of this Imperial trade passed through the port of London. English ships brought the supplies from overseas to London, and other English ships distributed them to the other countries on the shores of the Atlantic Ocean. Such trade as this is called *entrepôt* trade, and the fact that London was the metropolis of the British Empire caused London to have the **greatest *entrepôt* trade** of any great port.

One important article in which London had and still has an extensive *entrepôt* trade is raw wool from Australasia. New Zealand still sends most of her wool direct to England, and the bulk of this wool reaches London. Australia sends wool, nowadays, direct to France, Germany and Belgium, although more than half of the wool which Australia exports still arrives at the port of London. In former times much less raw wool was sent from

Australia direct to France, etc. The change is due to the fact that, instead of sending wool to London to be sold at the London wool market, the sheep rearers of Australia sell some of their wool in the markets of Australia, at Sydney and Melbourne. Much of the wool is destined to be sent from the port of London to the English woollen manufacturing district in the West Riding of Yorkshire ; and at the present time the wool buyer of Yorkshire, like the wool buyers of the Continent, send their representatives to Australasia to buy wool on the spot.

In a similar fashion, London will tend to lose its commanding position with reference to other articles, as the buyers find that they must purchase larger quantities, and that they can purchase more economically on the spot where the commodity is produced.

New Zealand trade with Britain.—New Zealand sends wool, frozen beef and frozen mutton, butter, cheese, kauri gum and flax to Britain ; and with the single exception of gum, more than three-fourths of the New Zealand export of these articles is sent to the United Kingdom. More than half the kauri gum is sent to the United States.

In return for these articles, New Zealand obtains more than three-fourths of her imports of apparel, cotton goods, woollen goods, machinery, goods made of iron and other metals from Britain. Only in the case of petroleum does New Zealand go elsewhere for the bulk of her supplies, in this case to the United States.

Australian trade with Western Europe, etc.—It has already been noted that Australia sends food stuffs to British South Africa ; she sends much larger quantities of the same food stuffs—wheat, frozen beef, frozen mutton, butter and cheese—to the United Kingdom. The trade in wool has been mentioned, and some meat is sent by Australia to Egypt.

Australia, like New Zealand, imports petroleum from the United States, and receives also preserved fish and machinery from the same country. Large proportions of manufactured articles are received in Australia, as in New Zealand, from the United Kingdom.

Total trade of Australia.—Australian imports amount to about 50 million pounds per annum, and the exports of Australian produce reach a total of about 70 millions. Therefore, on the average, each inhabitant of Australia buys about £10 and sells about £14 worth of articles in trade with the inhabitants of other countries.

Total trade of New Zealand.—Both the imports and exports of New Zealand amount annually to about 17 millions each, so that

on the average each New Zealander buys and sells with outside people about £17 per annum. The New Zealander thus buys per head much more, and sells a little more than the Australian.

SUMMARY.

Australasia produces foodstuffs and raw materials which include minerals. These articles are chiefly sent to Europe in exchange for manufactured goods.

25. Australasia : Special Features.

1. From a map in your atlas make on tracing paper an outline map to show Australia and New Zealand. Show also New Guinea, marking carefully the British portion, the Territory of Papua, the Tonga Islands, Fiji. Mark on the map distances from Sydney and Wellington to Fiji, making estimates of these distances from the scale of the map.

2. On an outline map of New Zealand mark the glacier district of the Southern Alps and the hot springs district of North Island, with the volcanic peak of Tarawera.

Australasian communications.—Since both Australia and New Zealand have been colonised chiefly by British emigrants who have reached the islands from over the sea, most of the settlements have been made comparatively near to the sea coast. Consequently, the railway lines which have been built to supplement the original roads connecting the various settlements are usually parallel to the sea coast, with side branches inland to some specially important town or village (Figs. 87 and 90).

The early settler found that a railway was necessary to enable him to send his produce easily to the coast ports for export overseas ; the later settler, spurred by the same necessity, has clung to the railways which he has found in existence and has colonised the lands near to the railway lines which former settlers had not occupied. The net result is that the bulk of the population inhabits the districts served by railways, and that most of the towns and villages are strung like beads along the railway lines.

Tourist traffic.—Many people from Europe visit Australasia. They are attracted by the beauty of the scenery, such as that of Sydney Harbour—one of the finest harbours in the world—or that of the coast district of South-western New Zealand, where the arms of the sea, such as Milford Sound, have a beauty all their own.

Other tourists rejoice in the open-air life and freedom from restraint of the Australian and New Zealand bush ; some of these cross the Australian Alps to the west of Sydney, others visit the upland districts of Southern Queensland, others make the journey inland from Christchurch, N.Z., to the foot of the Southern Alps, visit the glaciers, pass through the famous Otira Gorge to the west coast, and explore the beauties of the New Zealand forest, which covers the lower slopes on the western side of these mountains. Still other tourists visit the wonders of the coral reef which fringes the western coast of Queensland for a thousand miles, the **Great Barrier Reef** ; or go to North Island, to the volcanic district, to see the devastation wrought by the great eruption of the volcano Tarawera in 1886, and the hot springs and geysers which still denote that the internal forces of the earth are not at rest in New Zealand : such travellers may even experience earthquake shocks to remind them that the crust of the earth is not in a settled state.

Neighbouring islands.—To the north of Queensland lies the large island of New Guinea, a tropical country where the tropical forest is so dense that the explorer can with great difficulty penetrate inland only a few miles. Part of this island—the territory of Papua—is governed by the Commonwealth of Australia.

Eastwards in the Pacific lie the 200 islands which are included under the name of Fiji. The largest, Viti Levu, is about two-thirds of the size of Yorkshire in England. These islands grow fresh fruits such as bananas and sugar cane, and have some trade with New Zealand, which acts as an entrepôt, p. 162, for the colony. The Government is incorporated with the government of many other British islands in the Pacific Ocean under the rule of a Governor appointed by King George V. A glance at the map of the Pacific Ocean will show many other smaller groups of islands which are under the rule of the same Governor, *e.g.* the Tonga and Gilbert groups of islands.

SUMMARY.

Australasia contains many natural wonders—artesian bores, geysers, glaciers, beautiful fiords—which attract tourists.

Many of the Pacific Islands form outlying portions of the British Empire.

TEST PAPER. I. AUSTRALIA.

1. Draw a map of Australia, and name on it :
(i) Arid areas ; (ii) chief mining districts and their products ; (iii) chief areas under cultivation ; (iv) main railways. (Syd. U.)
2. Why is the interior of Australia rainless and of little commercial value? (Mad. Sch.)
3. Describe, with a sketch map, the railway system of Australia, and explain the reasons for (i) the presence, and (ii) the absence of railways, in different districts. Indicate the connection between the railways and the chief ports.
4. What are the chief occupations of the people of Australia? Show how the differences in climate affect these occupations.

TEST PAPER. II. NEW ZEALAND.

1. Show how the principal dividing range of South Island affects the climate, the surface features, the products, the industries and the population of the districts that lie between it and the sea. (N.Z. Ed. Dept.)
2. Following is the rainfall recorded in 1906 at some of the observation stations : Rotorua, 45 inches ; Napier, 32 inches ; New Plymouth, 58 inches ; Christchurch, 30 inches ; Hokitika, 116 inches.
 - (a) Give some explanation of the differences in the records.
 - (b) From what direction in each locality do you think rain usually comes? Give reasons for your statements.
 - (c) How does the above noted rainfall affect the industries and products of each district? (N.Z. Ed. Dept.)
3. How is the population distributed throughout New Zealand? Where are the densest portions to be found? Give reasons for your answer. Why should the more important towns be on the *east* coast of South Island rather than on the *west*? Illustrate your answer by reference to Christchurch and Dunedin as compared with Westport and Greymouth. (N.Z. Ed. Dept.)
4. What are the four chief exports of New Zealand? What markets do they supply, and in which exports does Australia compete with New Zealand. (*N.Z. Ed. Dept.)





SECTION II. AFRICA.

26. Africa.

1. Practise drawing outline sketch maps of Africa south of the equator (Fig. 100).

2. Make an outline sketch map of Africa, south of the equator, and enter on it from an atlas or wall map the parts of the Union of South Africa, with their respective capitals. Show the Orange, Congo and Zambesi rivers.

3. Mark on an outline map of Africa, traced from Fig. 99, the Sahara and Kalahari deserts, the region of tropical forests, the two regions of winter rainfall: insert the Nile and Victoria Lake.

Africa.—Africa consists of a large mass of land, which stretches for just over 30 degrees of latitude, *i.e.* over 2000 miles, both north and south of the equator: it includes the large island of **Madagascar**, which is a French colony.

Most of Africa consists of portions of the British and French empires (Fig. 81); and there are also the Portuguese colonies of **Angola** and **Mozambique**, the Italian colonies of **Tripoli** and **Eritrea**, the **Belgian Congo** and the independent countries, **Morocco**, **Abyssinia** and **Liberia** (Fig. 99.)

Size.—Africa is about four times as large as Australia, and that part of the British Empire which is African is about as large as



FIG. 100.—OUTLINE MAP OF AFRICA SOUTH OF THE EQUATOR.

Australia. The **Transvaal** is just a little smaller than the United Kingdom, and about as much larger than New Zealand.

Population.—Africa contains about 90 millions of people who are black in colour, and many of them are negroes and are distinguished by their kinky hair (p. 10). There are also about $1\frac{1}{2}$ million white people, either settlers from Europe or their descendants. Consequently, there are in Africa fewer white people than there are in Paris, Berlin or Constantinople, and there are about as many non-white people as there are people in the United States.

Relief.—Africa is almost entirely upland and mountain. The lowland, which is shown by the green colour in Fig. 99, fringes the coast; the Sahara desert and the **Belgian Congo** are almost entirely upland, extending to a height of about half a mile above the level of the sea; and most of Africa south of the equator, as well as a piece of country stretching to the north from **Rhodesia** to Abyssinia, consists of upland which is about a mile above the level of the sea. Rising above this upland are mountains which reach the height of more than three miles in the peaks **Ruwenzori**, Kilimanjaro and Kenia in the neighbourhood of Lake **Victoria**.

Consequently, Africa resembles Australia, but has a smaller quantity of lowland, and also has higher mountains. Like the Australian highlands, the mountains of Africa stretch from north to south, comparatively close to the east coast.

Africa has mighty rivers—the Congo, the Nile, the Niger and the Zambesi.

The **Nile** flows from the equator to the Mediterranean Sea, a distance in a straight line of more than 2000 miles; with its windings the river is more than 3000 miles long, so that a journey from Alexandria to Lake Victoria is as long as from Liverpool to New York.

The **Niger** rises comparatively close to the coast of Liberia, and makes a great bend to the north, which takes the river into the Sahara desert, and finally enters the sea in the **Gulf of Guinea**.

The **Congo** rises among the eastern mountains, and flows across the higher and lower uplands for a distance of about 2000 miles, and then drops rapidly to the coast on the west. On the upland the river is navigable, but during the drop to the lowland and the sea the river flows so rapidly that it is useless for boats.

The **Zambesi** rises on the higher upland, drops to the lower upland at the **Victoria Falls** (Fig. 99), and finally reaches the east coast after a course of nearly 2000 miles.

A basin of internal drainage.—**Lake Chad** receives the waters of many streams, but has no outlet. The lake varies in size. When the water from the streams flows into the lake more rapidly than usual, the lake grows larger and the surrounding country is flooded. When the streams are low and the evaporation of the water is increased by the hot sunshine in the dry season, then the lake shrinks. Lake Eyre, in Australia (Fig. 84), is a similar lake, and forms a similar basin of internal drainage.

Non-European people.—The non-European races of Africa differ greatly. In the north, in the neighbourhood of the Sahara, are the Arabs, a great race of traders, whose business has led them to traverse the desert with caravans of camels from time immemorial.

In Egypt are the **fellahin**, the peasantry of the country; they have been tillers of the soil since the early days of history.

Further south are the **blacks**, who are distinguished by their kinky hair. Numerous races of blacks are to be found in different parts of the British Empire. In British South Africa are to be found the *bushmen*, the *Zulus*, the *Hottentots*, etc. Most of these races either till the ground or tend cattle, and most of them differ from the Arabs and the fellahin because they cannot be easily trained to work like the white man works. When the railway was built from Lake Victoria to the coast, the natives could not be employed, and "coolies" were brought from India as labourers. The bushmen, like the *pigmies* of the Congo forest, resemble the Australian aborigines in their lack of intelligence. The Maori resemble the fellahin in their power to adapt themselves to the white man's way of living.

White men.—There are Britons, French and Belgians in their respective colonies. There are also Italians, Greeks and other Mediterranean peoples in Egypt. In South Africa there are the **Boers**, the descendants of Dutch settlers who colonised South Africa many years ago.

Most of the Boers are farmers; they till the land chiefly in the Transvaal and the Orange Free State. On the whole, they confine their work largely to supplying their own needs and are not interested in the peoples who dwell elsewhere in the world. In Rhodesia, British settlers are farming the land as in New Zealand; they grow tobacco, cotton and maize.

But, as a rule, the white man in Africa is not a farmer; he is either a miner, or a trader. In the south, the white man mines gold

and diamonds ; in the north and centre the white man trades for rubber, or for palm oil.

Consequently, many of the white men in Africa have no intention of settling there ; as soon as their business is finished they return to their homeland and their places in Africa are taken by younger men, who in their turn will spend a few years in the country before they return home to settle down.

Towns.—Consequently, the great towns of Africa are either capital cities, or mining, or trading towns. **Cairo** and **Alexandria** in Egypt represent the oldest capital city and the oldest trading town respectively. **Tunis**, **Algiers** and **Tangier** are trading towns and ports on the Mediterranean Sea which resemble Alexandria.

From Morocco, along the west coast, the Sahara desert reaches the sea and there are no towns until Bathurst is reached, then **Freetown**, **Accra** and **Lagos** are the chief towns along the coast and are at the same time trading ports and capitals of colonies. The arid or semi-desert country reaches the west coast and there are no towns until **Cape Town** is reached. This is the capital city of the Union of South Africa and is the greatest port in Africa south of the equator. Inland, in the Cape of Good Hope, is **Kimberley**, the diamond mining town, while **Bloemfontein** is the capital of the Orange Free State, and **Pretoria** is a capital and a gold mining town in the Transvaal. Natal has a large port, **Durban**, while **Maritzburg**, the capital, is close by. **Lourenço Marques** and **Beira** are trading ports. Khartoum, at the junction of the Blue and White Nile, is the capital of the Anglo-Egyptian Sudan.

These are the chief towns of Africa ; they are few in number and are comparatively small places. The native dislikes life in towns, and the white man is so scattered over the wide expanse of the continent that except for mining, or for shipping, his business prevents him from making towns.

SUMMARY.

North Africa, along the Mediterranean Sea, has been inhabited for centuries by Arabs and similar semi-civilised races. French, Greeks, Italians have settled in the coast towns.

South Africa is the home of the native blacks, while a few Europeans have settled there to mine for diamonds or gold, or to farm.

Inland Africa, like inland New South Wales, is reached from the sea by climbing from the coastal plains on to the central plateau.

The towns of Africa, like the towns of New Zealand and Australia, are small: they are either ports, mining camps, or trading centres.

EXERCISE.

1. Draw a map of Africa south of the Zambezi. Show the chief rivers and half-a-dozen of the chief towns, and indicate high ground by a simple system of shading. (Sc. Ed. Dept.)

27. Climate and Vegetation Regions.

1. Draw an outline map of Africa, and mark on it the regions of the veld and park-land, the trade winds, the region of monsoon rains, and name Abyssinia, Natal, the Orange River.

2. Draw an outline map of South Africa and another outline map of Australia by its side, using the same parallels of latitude for both maps. Insert on the Australian map the rainfall regions from Fig. 51, or from memory, and draw on the African map the regions of summer and winter rains, the deserts and the wind directions as you think they ought to be because Africa and Australia are in the same latitude south of the equator.

Winds.—The winds of Africa near the west coast are the constant north-east and south-east trade winds (see Figs. 59 and 60 for Africa north of the equator) and the westerlies which reach the Mediterranean shores and the shores of the Cape of Good Hope in the winter.

On the east coast, north of the equator, the winds are the monsoon winds of the North Indian Ocean (Fig. 58); south of the equator there are the on-shore south-east trade winds.

Rainfall.—Consequently, the trade winds cause the Sahara desert, the Kalahari desert and the arid or rainless west coasts of Africa, just as the trade winds cause the desert of Australia (p. 147) and the arid west coast of Central Africa.

Consequently, also, the rainfall in Abyssinia is monsoon rainfall, and the arid region of Somaliland has little rain, in the same way as the rainfall on the western Himalayas is monsoon rainfall, and the desert of Thar in India is rainless (p. 84).

The east coast of Africa south of the equator has a rainfall which resembles the rainfall along the east coast of Australia (p. 147). On the cool edges of the deserts the rainfall, in the Mediterranean region and in the Cape of Good Hope, is winter rainfall, just as the rainfall in Australia near to Adelaide and Perth is winter rainfall.

In Queensland, Australia, the rainfall is summer rainfall ; therefore in the Sudan and in the Transvaal and Rhodesia the rainfall is summer rainfall.

Temperatures.—In Equatorial Africa—*i.e.* in the Congo State, in British East Africa, and in British West Africa—the temperature is high. On the coast the air usually is as warm as 80° F., and there is only a slight change between the cool season and the hot season. The temperature changes in the way shown (Accra, Fig. 55). But most of Equatorial Africa is upland ; in the valley of the Congo River, the average temperature is 10° cooler than near the coast, and further east on the high plateau the air is at least 20° cooler.

At the same time, because the interior country is distant from the sea, the temperature of the air changes between the cool and the hot seasons, so that it is hotter in the hot season than on the coast, and cooler in the cool season. This example of a continental climate (p. 77) is a reminder that the night temperature is often also much colder than the temperature during the day time. It must also be remembered that the temperatures of the air, to which the geographer refers, are temperatures taken from thermometers placed in the shade. In Equatorial Africa the shade temperatures are high, while the temperatures in the sunshine at mid-day must be much higher still.

In the winter rain regions, the summer temperature is very hot, much hotter than an English summer, while the winter temperatures are not cold, but merely cool, and resemble the temperature of June in England.

There is, therefore, very little snow in Africa : only on the tops of the high mountains is snow usually seen, and only on the highest of them does snow remain throughout the year.

Vegetation.—The constant rainfall of Equatorial Africa, and the high temperatures, make this part of the continent a region of dense forests, where the trees grow so close, and the shrubs and creepers are so numerous, that the native has to cut his way through the virgin forest, and a track once made has to be used continuously or it will disappear. The vegetation is so intertwined overhead that the sun's rays rarely reach the ground, and the traveller who journeys along the forest tracks is surrounded by an everlasting gloom.

Only the mountains and the high uplands of this part of Africa are free from the forest, for the cooler and drier air of the higher altitudes prevents trees from growing in the profusion which they attain in the lowlands and lower uplands.

On the edges of the forests are the summer rain regions of the Sudan and Rhodesia ; and here the vegetation is such that grass, small shrubs, and bushes grow. By some travellers such land is called **park-land**, by others it is designated **savannah**. In the hot season some rain falls, and the plants are sure of a supply of water and grow profusely ; but in the cool season, although it is still hot, the absence of rain causes many or most of the plants to die, and the land is brown and parched. As soon as the rain comes, the green shoots of the new plants come into view with almost magic suddenness.



FIG. 101.—THE ORANGE RIVER.

Photo Underwood & Underwood.

(Find the figure of a man in the foreground. The bush vegetation on the river bank is seen, therefore, to be less than 6 feet in height. Away from the river the land is semi-desert.)

Further from the forests the land is always brown, the soil is always dry, and the true desert begins. Because the northern half of Africa extends so widely from east to west, the Sahara desert is much wider than the Kalahari, and in the Sahara there are large districts where there is a slight fall of very gentle rain for a short time on perhaps one day in each year ; while in the Kalahari every hot season brings with it some refreshing showers of gentle rain. Consequently, in the Sahara there is no sign of vegetation except where water rises from the soil in springs and forms small ponds, round which the Arabs plant trees, such as the date palm, and thus make fertile spots called oases (Fig. 108). But in the Kalahari, certain

kinds of plants with bulbous roots, like that of the hyacinth, are able to live underground throughout the long dry season, and burst forth with green shoots during the short time when the rain falls.

The Veld.—The Transvaal and the Orange Free State contain the region known as the **veld**. There the summer rains are more frequent, and the quantity of rain which falls is greater; consequently, the veld is either a dry dusty brown expanse in the dry season, or a beautiful green carpet interspersed with many bright flowers after the rains. The veld is at two levels, and the high veld is more grassy than the low veld, which has bare stony patches scattered across it. Consequently the fertile veld, the veld with poorer grass, and the Kalahari make a series of regions which are increasingly barren; and Africa contains examples of all the varied kinds of grass country, from the fertile grass-land similar to that of an English meadow to the arid regions, such as those which occur, with occasional tufts of grass, in the dry plains of Arizona near the cañon of the Colorado.

The winter rain regions.—The Mediterranean region has been cultivated by man for thousands of years; it is the home of wheat, of the olive tree and the fruitful vine. There are to be found the fig tree and all trees similar to the orange; consequently the countries of the Mediterranean with their hot dry summers and cool wet winters are districts of plantations, wherever man has replaced the natural vegetation by cultivated plants.

The natural vegetation includes evergreens such as the laurel and the cedar, thorny spiked plants with fleshy leaves such as the various kinds of cactus, as well as the walnut and certain kinds of chestnut tree.

Because of the scanty rainfall and the intense sunshine, as well as the dry air of the summer time, all plants check the evaporation of moisture from their leaves and fruits. The skin of the orange, the tough skin of the leaf and the outer husk of the fruit of the walnut, are the methods adopted by these plants; while other trees turn their leaves sideways to the sunshine and cast little shade on the ground below.

Along the African shores of the Mediterranean, from the east westwards, the Sahara reaches the coast from the Suez Canal to Tunis, so that Egypt and Tripoli are arid regions of scanty vegetation.

In Tunis, Algeria and Morocco the rainfall is heavier and the vegetation denser: the fig is a typical tree, wheat a common cultivated plant, and alfalfa, a sample of the natural grasses. Alfalfa,

or lucerne, is a kind of grass which flourishes best in a soil which is dry and slightly impregnated with salt.

SUMMARY.



FIG. 102.—SUMMARY MAP OF AFRICA.

EXERCISES.

1. Describe the characteristics and distribution of the natural vegetation regions of Africa. With what type of rainfall is each associated?
2. Describe and explain with the aid of a sketch map the distribution of rainfall over Africa, and point out the connection between the rainfall and the vegetation.

(C.W.B.)

3. By means of a sketch map show the position of the desert areas of Africa. Write a brief account of the Sahara, dealing with (a) its vegetation, (b) trade, (c) inhabitants. (C.G.H.)

4. Draw a sketch map of Africa, marking the position of the equator and the tropics of Cancer and Capricorn. Shade two areas of deficient rainfall, and two areas clothed in dense forest. Mark and name the Atlas and the Drakensberg Mountains, the rivers Nile, Congo, Niger and Zambezi, and the lakes Chad and Victoria. (*C.S.C.)

5. Draw a map of Australia or Africa to show the distribution of rainfall. Insert arrows to show the direction of the prevailing winds. Write the name of the season of the year in which most rain falls over places where there is a marked seasonal variation in rainfall. (Sc. Ed. Dept.)

6. Explain fully the following statements, and give reasons for the existence of such a state of affairs :

(a) "Johannesburg, although much nearer to the equator than Cape Town, has the same *mean annual temperature*, namely 62° F."

(b) "The *average annual rainfall* of Port Elizabeth for the years 1898-1902 (inclusive) was 22.4 inches whilst that of Beaufort West for the same period was only 7.88 inches."

(C.G.H.)

28. South Africa.

1. Draw a sketch map of Africa south of the equator. Insert from Fig. 99 or from memory the Orange, Vaal, Zambesi, Limpopo and Congo rivers. Name Lakes Tanganyika and Victoria.

2. Draw a sketch map of Africa south of the equator. Insert from Fig. 103 that part of the Cape to Cairo Railway which lies south of the equator. Write on your map the word *dry* to indicate the arid region, the word *rainy* to mark the district where rain falls. Mark on your map by the word *veld* and the word *desert* these two regions respectively. Insert from Fig. 103 the western boundaries of the Orange Free State and the Transvaal. From your completed map deduce reasons why the railway takes its present course between Cape Town and Kimberley and between Kimberley and Salisbury.

South Africa.—Africa south of the equator is in the hands of four imperial nations—Britain, Germany, Portugal and Belgium (Fig. 103).

British South Africa.—The **Union of South Africa** includes the Cape of Good Hope (formerly Cape Colony), Natal, the Orange Free State and the Transvaal, as well as Protectorates such as Bechuanaland. The Union, which includes Rhodesia and the conquered territory of South-west Africa, separates Portuguese



FIG. 103.—SOUTH AFRICA: STATES, TOWNS, AND RAILWAYS.

W.J.G.

M

West Africa (Angola) from Portuguese East Africa (Mozambique), and has Belgian Congo beyond its northern boundary.

The **Cape to Cairo Railway** (Fig. 103) starts at Cape Town, and passes through **De Aar** Junction and on to **Kimberley**, the diamond mining centre in the Cape of Good Hope. De Aar is 500 miles by rail from Cape Town, and the railway climbs on to the upper plateau in this distance. For 100 miles from Cape Town the railway winds over the coastal plain, then it climbs on to the lower plateau, locally called the **Lower Karroo**, and finally reaches the **Upper Karroo**, or the New Veld, about 100 miles from De Aar, which lies at a height of nearly a mile above sea level. The rest of the railway keeps to the upper plateau. From Kimberley, the line skirts the boundaries of the Orange Free State and the Transvaal until Rhodesia is reached. At Bulawayo occurs an important junction—a line leads north-eastwards through Salisbury to Beira, a port on the coast of Portuguese East Africa; and a second line leads north-west to the Victoria Falls, where a bridge has been thrown across the canon, and on through the mining town of Broken Hill to the Congo boundary. In time the line will be made to the shores of Lake Tanganyika.

The railway route is interesting: all the country to the west is arid and therefore unproductive, to the east lies the fertile veld; but when the line was built the veld was not British; consequently, the route skirts the boundary line just as closely as the engineers could plan the line without leaving British territory. Hence, the most important part of British South Africa lies to the east of the railway, which cuts the Cape of Good Hope into two parts, the barren and the productive regions.

The boundaries of the British States are equally interesting (Fig. 103). Some of them are due to natural features: the Orange river near its source and again near its mouth forms the northern boundary of the Cape of Good Hope; the Vaal forms the southern boundary of the Transvaal, which is bounded on the north by the Limpopo. Part of the boundary of Portuguese East Africa and Rhodesia runs almost along the 3000 feet contour, and the Natal boundary follows fairly closely the line of the highest peaks of the Drakensberg, which form the mountain rim of the upper plateau on its eastern side. The boundary between the Cape of Good Hope and British South-west Africa, north of the Orange, is purely artificial, being meridian 20° E.

The Cape of Good Hope, therefore, consists of the lowlands near the coast, the first terrace of the Lower Karroo and the second

terrace of the Upper Karroo. The eastern half of the state contains the fertile districts, the chief towns and farm lands, and therefore it is crossed by the network of railway lines which lead into the Transvaal from the ports of Port Elizabeth and East London. The fertile districts produce cereals, chiefly maize, and contain plantations of the grape and other Mediterranean fruits. Here and there in favoured spots are the ostrich farms, where the native bird of the arid regions, the ostrich, is reared for the sake of its plumes, which are taken from the tail of the bird and exported almost entirely to Britain. Near the Natal boundary the land is reserved for the native races, and there are no railways (Fig. 103). Far away on the west the copper mines of **Ookiep** lie in the desert, and are connected by a special railway line with the port: this line resembles some of the lines of Queensland (Fig. 90).

The Cape of Good Hope is on the whole a farmer's country; there are few productions of world-wide importance, and the main interest of the population lies in providing their own food and a surplus of food for the mining populations which are concentrated round the gold mines of the Transvaal. The farmers do not produce sufficient food for this purpose, and consequently at Cape Town, Port Elizabeth and East London ships unload cargoes of wheat, flour, beef, mutton and other food-stuffs from Australia and Argentina.

Natal.—**Natal** lies between the Drakensberg and the coast, and is therefore rainier and warmer than the Cape State. The country is cut up by many narrow valleys.

Maize and some tea and cane sugar can therefore be grown, and for this reason many of the people are farmers like the people of the Cape State. In the north, at **Newcastle**, there are coal mines, which supply coal for the gold mines of the Transvaal, fuel for the householder, and coal for the ships which use the ports of Cape Town and Durban. The railway line runs inland from the port, Durban, to the capital, Maritzburg, and to Newcastle: it has been continued on to the upper plateau, and one route leads to Bloemfontein and the second leads to Pretoria. Although on a smaller scale, Natal resembles the coastal portion of New South Wales, just as the Orange Free State and the Transvaal resemble the country round the Darling river—the downs of Australia.

The inland states.—The **Orange Free State** and the **Transvaal** are similar, because the country is naturally a grass land—the Veld. Both are elevated, and many of the people in both countries are

farmers, whose chief concern is to provide food and clothing for themselves by the produce of their tillage and ranching.

The two countries differ, however, in one important respect—the Orange Free State has no mines, and the Transvaal is the most important gold-mining country in the world. Nearly one-third of the world's gold is mined chiefly on the Witwatersrand (White water ridge), in the neighbourhood of **Johannesburg**.

Consequently, in the Transvaal there are roughly two classes of people—those who farm and those who mine. The farmers have made the country their home; they live in substantial houses, and because the climate is dry and sunny, their houses are surrounded by a verandah, and are airy and shady. Because the South African farmer cannot produce food-stuffs for export, his house does not make a show of wealth, but rather represents comfort: in many cases, for example, the floors are of hard earth, and the house is not a specimen of beautiful architecture. The men who mine, or who trade with the miners, congregate in the towns, in many of which the chief buildings are of corrugated iron: the miner does not intend to make the country his home, and therefore builds in a hurry a shelter which can be erected cheaply and quickly.

Rhodesia.—**Rhodesia** is park-land, and is scantily peopled. It is the chief place in South Africa which attracts European settlers who can grow cotton, tobacco and cereals. It is expected that in time Rhodesia will supply the markets of the world, and consequently the settler is interested in the outside world.

Rest of South Africa.—The east coast countries, Portuguese East Africa, both the new and the old British East Africa (Fig. 103), consist of a strip of coastal lowland, which is rainy, partly forested, therefore swampy. It is not fit for European settlement.

Further inland the land resembles Rhodesia, and shares that country's hopes for future crops of tobacco and cotton.

The west coast countries, British South-west Africa and Portuguese West Africa, have an arid climate; the coast is inhospitable, and only at Walfish Bay, an old British port, Luderitz Bay and Swakopmund are there important coast towns. From the two latter, railway lines run inland to the mining settlements, just as in the case of Ookiep.

The **Belgian Congo** is tropical: much of it is forested, and the chief product of importance is the wild rubber, which the blacks collect from the forest.

The native races.—The chief problem for the handful of

Europeans who live and work in Africa is the native races. The black, whether Kafir or Zulu, shows little inclination to work in the mines or the fields, on the railway lines, in engineering work, or on the plantations. Great stretches of country have been set aside for his sole use, and from these districts men are persuaded to enlist as labourers, particularly in the mines. These men are herded together inside compounds surrounded by corrugated iron fences and have little freedom. They serve their term, receive their wages, and return to their native village to resume a life of comparative idleness. Each tribe is ruled by a petty chieftain, and usually inhabits a definite district. Sometimes the whole tribe migrates to another area which offers a more satisfactory home. But many of the blacks live amongst the whites in the towns and on the farm lands: their wants are few and easily satisfied; and they are so numerous as to be a source of great difficulty to the white population.

SUMMARY.

In the "scramble for Africa," Britain, Portugal and Belgium secured portions of South Africa (Fig. 103).

British South Africa stretches from the south coast northwards in the middle of the land, and contains a large portion of the savannah uplands, where Europeans can live with safety.

Like Australia and New Zealand, British South Africa contains farmers and miners: unlike other parts of the Empire none of the South African states can produce sufficient quantities of food stuffs for their own population.

EXERCISES.

1. Describe the configuration, climate, products and chief towns of either Natal or South Island, New Zealand. (C.W.B.)
2. Name important mining centres in Australia and South Africa for the following: gold, silver, copper, diamonds and coal. (*C.W.B.)
3. How many railway routes are there from Johannesburg to the coast? To what seaport do they lead? Select one route and name the principal towns through or near which it passes. (C.G.H.)
4. Write a careful account of the productions, people and government of the South African Union. (Vict. Ed. Dept.)
5. Expand, criticise, explain and comment on the following: "On the whole, however, in the scramble for Africa, we have no reason to complain of our share. All in all, for development by Europeans, the great region south of the Zambesi is more favourably situated than any other part of Africa of equal extent." (Sc. Ed. Dept.)

29. North Africa.

1. Study Fig. 99. Examine the north-western corner of Africa. Write a few sentences to point out the difference between the coast line of Morocco east of the Strait of Gibraltar and the coast line of Tripoli.

2. Write out as briefly as possible the great contrast between Africa north and Africa south of the equator, as regards relief, climate and vegetation. How does the presence of sea on the east make South Africa differ in climate from North Africa?

North Africa.—North Africa consists of the Sahara desert and the countries which border this desert. Wherever sufficient rain falls for the growth of plants a state has been established: *e.g.* North-west Africa has rains in winter, and consequently there are the French states, Tunis and Algeria, and the independent state, Morocco.

West Africa.—West Africa is the name which is applied to those countries which border the Sahara desert on one side and the Atlantic Ocean on the other. These countries touch the Atlantic Ocean from the mouth of the river Senegal to the mouth of the river Congo. Except Liberia they are all colonies of European nations, as shown by the annexed table :

British Colonies.	French Colonies.
Gambia.	French Guinea.
Sierra Leone.	French Ivory Coast.
Gold Coast.	Dahomey.
Nigeria.	French Congo.

When these colonies are approached from the desert, the traveller passes through savannah-lands on the uplands, and as he nears the coast he reaches the edge of the upland, and on the seaward slopes he finds the tropical forest, which is so dense that it hinders his journey.

From the upland flow westwards the two rivers **Senegal** and **Gambia**, and north-eastward the **Niger**. Later the Niger bends round the upland, and then breaks through it; it then receives the tributary, the **Benue**, from the north-east, and the joint stream makes an extensive mangrove swamp, across which branches of the river meander to the sea, thus making a malarious fever-haunted delta.

The upland savannah country is healthy for Europeans, and is thus the exact opposite of the coastal lowlands, where Europeans can only keep their health with the greatest care.



(Note the extent of the African plateau, the Abyssinian mountains and the narrow trench which the Nile has cut in the plateau.)

Europeans are not numerous, and most of them are Government servants or traders. The blacks are of many tribes and collect forest produce such as wild rubber and palm kernels, from which palm oil is extracted for the purpose of making soap. Attempts are being made to grow cotton on the savannahs.

To open out the country for settlement, railways are built from the coast ports inland. The chief of these are from **Sekondi** to **Kumassi** in the Gold Coast Colony, and from **Lagos** to **Zungeru**, beyond the Niger, in Nigeria.



Photo Underwood & Underwood.

FIG. 105.—THE KHARTUM BRIDGE OVER THE BLUE NILE.

(The river is in flood ; for the photograph was taken in August.)

East Africa.—The eastern horn of Africa contains the arid region of Somaliland, where hunters of big game may still find their prey. Antelopes, lions, hippopotami, etc., are still wild in sufficient numbers to provide big game hunters with sport.

On the upland lies **Abyssinia**, a mountainous district, from which flow the three tributaries of the Nile—the **Sobat**, the **Blue Nile** and the **Atbara**. These mountains are continued northwards in the ridge of highland which separates the valley of the Nile from the Red Sea.

The coast strip along the Red Sea is **Eritrea** (Fig. 104), which is an Italian colony. Next along the coast is French Somaliland, which contains the chief port **Jibuti**, almost opposite to the British fortified coaling station, Aden. Next is British Somaliland, and then follows Italian Somaliland.

Egypt.—Egypt is the Nile and the Nile is Egypt. The river Nile is fed by the overflow from two large natural reservoirs of

water, Lakes Victoria and Tsana. **Lake Victoria**, on the equator, receives the surplus waters of a district where the rain falls almost regularly the whole year round. The overflow from the lake descends by the Ripon Falls and the Murchison Falls, and the water flows northwards as the White Nile. The White Nile flows through the summer rain savannah country of the **Anglo-Egyptian Sudan**, and therefore, during the summer months, the river receives small supplies of water from many small tributaries. These tributaries only flow during the summer; during the rest of the year the valley of each tributary is empty of water and is called a **wadi**. After the White Nile has sent its water a thousand miles it receives its first great tributary, the Sobat. About 700 miles further down stream the Blue Nile adds its water, and still further down stream the Atbara. These three tributaries supply very little water during the winter months, but when the monsoon rains have fallen between May and September upon the mountains of Abyssinia, and when the reservoir of **Lake Tsana** is full to overflowing, then the Blue Nile in particular, and the other rivers in a smaller degree, supply so much water to the White Nile that the stream rises rapidly and becomes very much deeper. Because the **flood**, as it is called, is due to the monsoon rains, and because the monsoon rains happen regularly almost at the same date each year, the Nile flood appears regularly each year almost on the same date.

After the Nile has received these tributaries, it flows through the rainless desert in a trench which is often less than ten miles wide. Outside this trench stretches the vast desert of the Sahara, and consequently this trench makes a long narrow oasis across the desert from north to south; in this oasis the people live, and therefore this trench is Egypt.

The country of Egypt on the map extends into the desert on both sides, but the people live in the trench and in a few scattered oases in the desert, so that the really important land is in the Nile valley.

The flood consists of very muddy water, and for centuries the Egyptian fellahin, or peasants, have used this water for their fields of millet, wheat and cotton. By means of some mechanical contrivance, such as those illustrated in Fig. 106, the fellahin has taken muddy water from the Nile and let it flow over his fields. He has thus given his seeds both water and manure, for the mud which the water leaves on his fields acts as a manure. It thus happens that most of the land which the fellahin cultivates for his crops has been brought to him by the Nile from the Abyssinian

mountains by the Nile flood ; consequently it may be said that Egypt is the gift of the Nile, in fact it may also be said that Egypt is the gift of the monsoons. Thanks to the fertile mud, the fellahin can frequently raise three crops a year in their fields. Most of the produce that they cultivate is for their own use, only cotton being exported from Egypt in large quantities.



FIG. 106.—AN EGYPTIAN WATER-WHEEL.

Photo J. Boyer, Paris

(The spokes of the horizontal wheel on the right fit into slots between the spokes of the vertical wheel. When the horizontal wheel is turned the motion is communicated by the vertical wheel to an axle to which the water-wheel is attached. Consequently the pitchers are steadily brought up filled with water which is conveyed to drainage channels.)

Because the Nile valley is Egypt, the chief towns of the country lie close to the river. No town or village lies far from the water on which life depends, from the villages of Wadelai and Gondokoro to **Khartoum**, the capital of the Sudan, and to Wadi Halfa, **Assuan** and Siut, where the Nile flood is harnessed by barrages or barriers across the river, and on to **Cairo**, the capital of Egypt, and **Alexandria**, the greatest port of the eastern Mediterranean. Consequently, the railway line passes from Alexandria southwards along the river valley (Fig. 104), and only from Cairo to Port Suez and from Berber to Port Sudan are there side branches across the desert to

the Suez Canal and the Red Sea, which form part of the great highway for ships from Europe to India and the East.

The Suez Canal.—The isthmus of Suez prevented ships from passing eastwards from the Mediterranean Sea until after the canal was built in 1867. Until that time no ships passed into the Levant on their way to Asia, and therefore Alexandria and Egypt have been made much more important by the Suez Canal, through which more than ten vessels pass each day. Of these ten vessels, six fly the Union Jack.

The map of the canal (Fig. 107) shows that Suez is 100 miles from Port Said, and that the canal crosses three lakes, Balah, Timsah and the Bitter Lakes. A railway line runs from Port Said to Suez and has a branch to Cairo.

North-western Africa.—The coastal land of Egypt is flat and low; the coastal land of Morocco and Algeria at the other end of the Mediterranean is mountainous. There are few harbours at the eastern end, because the desert lies near to the sea; there are few harbours at the western end, because the mountains lie close to the sea and make the coast rocky and inaccessible. The mountains of this land are

known as the **Atlas Mountains**. The Atlas mountains differ from the Drakensberg, because they are real mountains, while the Drakensberg, like the Australian Alps, are the steep edge of a high plateau. The Atlas resembles the Southern Alps of New Zealand and the Alps of Europe; they are due to folds in the earth's



FIG. 107.—THE SUEZ CANAL.

crust. The Atlas Mountains lie parallel to the coast in ridges, between which lie long narrow valleys parallel to the ridges. Consequently, it is more easy to travel along the valleys from east to west than it is to travel from one valley across the ridge to the next valley or to the coast. In the valleys lie many small lakes or pools of water called *shotts*, near which the Algerians live. The Algerians are either French settlers, or Arabs or their descendants.



FIG. 108.—SAHARAN OASES.

(Each dot signifies a place where water occurs and where flourishing palms surround and shade the pools.)

Under the tuition of the French, the Algerian grows wheat for export to France, orange and olive trees in plantations (p. 118), and exports quantities of olives and olive oil. In the hilly districts there are many sheep, the wool of which forms one of the chief exports.

The Sahara.—Life in the Sahara without water is impossible. The water is found welling from the ground, and round the pond thus formed villages of Arabs, etc., have grown. Oases are comparatively numerous in the Sahara (Fig. 108). The chief product of these oases is the date, which is the fruit of one of the numerous forms of palm trees. Travelling in the desert depends on camels.

SUMMARY.

In the "scramble for Africa" Britain obtained parts of West Africa and the Anglo-Egyptian Sudan; Germany secured the Kamerun and Togoland; France—Algeria, Tunis and the French Ivory Coast and Sudan; while Italy had Eritrea and Tripoli.

The Nile flood is due to the monsoon winds in the Indian Ocean. Egypt is the gift of the Nile ; therefore the people of Egypt depend for their lives upon the monsoon winds.

Algeria and Tunis are the most productive regions of North Africa ; they supply their mother country—France—with wheat, olives, dates.

EXERCISES.

1. "The Nile is Egypt and Egypt is the Nile." Explain carefully the significance of this statement. (C.S.C.)
2. Account as fully as you can for the fertility of Egypt, and describe the position of four of the chief towns. (*S.A.)
3. Consider the Nile. State (*a*) in what mountain system or plateau it rises ; (*b*) in what direction, and (*c*) through what kind of country the *main stream* flows to the sea ; and (*d*) describe the mouth of the river. (*e*) Point out the climatic conditions of its source ; and (*f*) whether it passes through other climatic regions. (*g*) Note the time of year at which you would expect it to be flooded, and (*h*) give your reasons. (*Sc. Ed. Dept.)

TEST PAPER.

1. Draw a sketch map of Africa, and show the main rainfall divisions of the Continent. Insert the Cape to Cairo Railway.
2. Describe a journey from Tripoli to Lake Chad and thence to the mouth of the Niger.
3. Describe, with a sketch map, the Cape of Good Hope State. Name three principal productions, and insert three chief towns.
4. In the case of each of the following :—Algeria, Congo Free State, Morocco, Nigeria : state (i) to what Empire it belongs, (ii) the chief products, (iii) an important town. (*C.U.L.)

SECTION III. THE AMERICAS.

30. South America.

1. Make a rectangle 4 inches by 3 inches. Draw a line parallel to the top and $\frac{3}{4}$ inch away from it. That is the equator. Draw a line parallel to the bottom and $\frac{1}{4}$ inch away from it : that is lat. 60° S.

Bisect each of these lines, and draw a line through the points of bisection, that is long. 60° W. Draw parallels 10° N., 10° S., 20° S., 30° S., 40° S., 50° S., parallel to the equator, and with distances of $\frac{1}{2}$ inch between each pair of parallels. Divide the equator into six equal parts, and divide parallel 60° S. into twelve equal parts. Along each line, beginning with the central meridian, label these points along the equator 50° W., 70° W., 40° W., 80° W. Label corresponding points along parallel 60° S. similarly, and draw straight lines through corresponding points to represent the meridians. This will give a network for South America similar to Fig. 85. Draw in the outline of the continent from Fig. 109. Insert the Amazon, the Orinoco and the Plate rivers.

2. On an outline map of South America insert parallels 0° S., $23\frac{1}{2}^{\circ}$ S., 40° S., and shade the land over 3000 feet high from Fig. 109.

Revise the work already performed on the climate regions of Australia and Africa (p. 175); and show on the outline map the trade winds and the westerlies. Mark on the land the districts where the rainfall would be heavy and constant, where the rainfall would be greatest during the winter, and where during the summer. Write the word *arid* along the coastline of the district which you would expect to be arid. Write the word *forest* where you would expect to find dense tropical forests, and the word *pampas* where you would expect to find grass lands.

3. Study Fig. 109. Write a short description of the relief of South America, directing special attention to large areas of lowland, and also to extensive stretches of highland. Illustrate your answer with an outline sketch map to show the water-parting between the Amazon and the Plate rivers. Write a short description of the difference between this water-parting and the water-parting between the Plate rivers and the streams which flow





down to the west coast. Compare the length of the Plate rivers with that of these streams.

Position.—South America is the third great mass of land which lies in the Southern Hemisphere. Like Africa, it lies on both sides of the equator, but the northern portion is smaller than the portion south of the equator.

Size.—South America is slightly longer from north to south than Africa; its southern end near Cape Horn is narrower than the southern end of Africa near Cape Town; and the widest part of the continent lying along parallel 5° S. is not so wide as the widest part of Africa which lies along parallel 10° N. Consequently, the area of Africa is greater than that of South America; in fact, Africa is rather larger than both Australia and South America together.

The first Europeans who visited South America in large numbers were Spaniards and Portuguese, and they found many dark-skinned native Americans, especially in the valley of the Amazon. Consequently, the greater number of the people who inhabit South America at the present time are known as Spanish-Americans. **Brazil** contains about half the area of the continent, and at least half the population, most of whom are native Americans; the others are Spanish-Americans and Europeans. **Argentina** has about one-third of both the size and population of Brazil.

Relief.—South America contains three masses of mountainous country. The highest mountains lie in the long range, the **Andes**, which stretch the whole length of the continent from north to south, and slope steeply down to the west coast in the same fashion as the steep western slopes of the Southern Alps of New Zealand (Fig. 29). The Andes form the water-parting of the **Amazon** valley on the west, and the slopes from the tops of the mountains down to the lowland level of 600 feet are almost as steep as the western slopes to the ocean. The northern water-parting of the Amazon is the mountainous mass of the **Guiana Highlands**, and the **Brazil Highlands** form the southern water-parting. The Brazil Highlands include several ridges of mountains which lie parallel to the coast after the fashion of the Atlas Mountains, but the intervening valleys are not so narrow.

Rivers.—The great rivers of South America are the **Orinoco**, the **Amazon** and the Plate rivers, the **Paraguay**, **Parana** and the **Uruguay**. These rivers differ almost entirely from the rivers of Africa, for they flow almost their entire lengths along lowland. In Africa the rivers

leave the upland and reach the lowland near their *mouths*, in South America they reach the lowlands near their *sources*. Consequently, the African rivers do not provide a highway for ships from the ocean, to the interior of the land, while the American rivers are frequently ascended for many miles by ocean-going vessels. In fact, **Manaos** on the Amazon may be considered a *sea-port*.

Winds.—The trade winds reach the shores of South America on the east. They blow as on-shore winds on the coasts of **Venezuela** and **Guiana** from the north-east (Figs. 59 and 60). They blow as on-shore winds on the coasts of Brazil; consequently, the lowlands of Guiana and Brazil are wet and forested, while the upper slopes of the highlands are grass-covered. The westerlies reach the coast of **Chile** in Western America south of lat. 30° S., and consequently the district round **Valparaiso** has winter rains in the same way as the district round Cape Town, while the coast land further south has rain at all seasons like the west coast lands of South Island, New Zealand. The eastern slopes of the Andes are dry like the eastern slopes of the Southern Alps; the coast lands of Argentina have a small rainfall like that of the Canterbury plains, and close to the Andes there is an arid region similar to the arid region of Otago, N.Z.

North of Valparaiso the coast lands of Northern Chile are arid like the coast lands of German South-west Africa: the **Atacama** desert is like the Kalahari. It is so dry in the Atacama district that deposits of **sodium nitrate**, which is soluble in water, have existed for centuries in such a rainless region. This nitrate forms the chief mineral wealth of the district, as it is extensively used by farmers all the world over for manure; it therefore forms the chief export of Chile.

Temperatures.—Fig. 110 shows the mean annual temperatures of America. The isotherms leave the west coast much nearer to the equator than they leave the east coast: this means that an east coast port like **Bahia** is much warmer than a west coast port like **Lima**. The west coast is colder than the east coast, because cold water flows northwards as an ocean current along the west coast of South America.

The eastern part of the Amazon valley is lowland, with a temperature of about 80° F. in the shade all the year round: because the country is equatorial, there are no seasons; the coldest month is only about 6° colder than the hottest month.

Valparaiso and Buenos Aires have about the same temperatures



FIG. 110.—ANNUAL ISOTHERMS AMERICA.

(Shaded area in North America = prairies, in South America = pampas.)

W.J.G.

N

on the average through the year as Cape Town and Port Elizabeth, or as Perth and Sydney. Because of the cold current in the ocean, Valparaiso is not quite so hot in summer as Buenos Aires.

Natural vegetation.—Because of the similarity in latitude, the Amazon valley is forested like the Congo valley, and the natives collect wild rubber there as in Africa. In the same fashion the grass lands of South America, called the **pampas**, resemble the grass land of Africa, the *veld*, and that of Australia, the *downs*.

These are **savannahs** with summer rainfall.

On the pastures of the Andes live the llama and vicuna, which are characteristic native animals of the same family as the sheep.

Cultivation.—Guiana and Brazil have a tropical climate similar to that of India and Ceylon. The lowlands of Guiana resemble the lowlands of India, and therefore some rice is grown. The coastal slopes of the Brazil highlands are similar to the coastal



FIG. III.—A LLAMA.

(From this animal a special kind of wool is obtained and exported from Peru.)

slopes of the island of Ceylon, and consequently the Brazilian grows coffee: in fact, he grows coffee so much more extensively than the planter in Ceylon that he produces four-fifths of the world's supply.

Uruguay and Argentina are natural grass land regions, which are gradually being devoted to ranching and arable farming. On the pampas are many **ranches** or **estancias**, where cattle and sheep are reared in large numbers. The country is divided into paddocks by wire fences, and, as in Australia, these fences are rabbit-proof, since the rabbits have multiplied so exceedingly as to become a nuisance. There are no trees on the pampas, and consequently each *estanciero* surrounds his house with a plantation of trees for the sake of the shade.

The ranching districts near to the sea-coast and near to the rivers are gradually being turned into arable farms on a large scale, where the farmer produces large crops of wheat and maize. Argentina is passing through the stages of development of all new countries where there are grass lands. The first settlers keep cattle

and sheep, and ranch for a livelihood ; later on, other settlers purchase small portions of the ranches and start arable farming, so that the ranchers continually break up virgin ground for their stock-farms, and at the same time move further and further from the



FIG. 112. - CATTLE.

(These provinces are the chief ranching districts of Argentina. Compared with New Zealand, Fig. 95, Argentina has more cattle, but relatively small areas of dense flocks of sheep. Where cattle are numerous, sheep are less numerous, and conversely). Bahia should be Bahia Blanca.



FIG. 113. - SHEEP.

sea. Consequently, the inland districts of Argentina have been covered with a network of railways, which are quite different from the railways of Africa or Australia, as they do not run from seaports to mining camps (Fig. 69).

Trade.—Brazil exports coffee and rubber.

Chile exports nitrate and a little copper

Uruguay exports meat and wool.

Argentina exports meat, wool, wheat and maize.

The exports of Argentina are of special interest because they are

sent to Brazil and British South Africa as well as to Western Europe, to the United Kingdom and Germany.

South America has no manufactures, and all the South Americans purchase iron and steel goods for their railways, hardware, etc., for their houses, farming implements and clothing from Western Europe and the United States.

The chief towns.—The chief towns are usually sea-ports and the capitals of the Republics (Fig. 109). Buenos Aires and Rio de Janeiro are about as large as Liverpool or Glasgow. Monte Video and Santiago are about the same size as Cape Town, and the chief of the remaining towns are about the same size as Walsall, England, or as Wellington, N.Z.

The settlers.—Argentina and Brazil grow more of their respective products than they need ; consequently, the settlers in these lands have a world-wide outlook. The Argentino, for example, competes with the New Zealander in supplying the manufacturing people of the world with mutton ; he competes with the farmer of the United States in supplying beef and wheat to Western Europe.

The Panama Canal.—The western coast of South America lies almost on the edge of the land hemisphere (Fig. 81) ; and ships for Valparaiso, for example, must either cross the whole width of the vast Pacific Ocean or steam round Cape Horn. Consequently, a ship canal has been cut through the isthmus of Panama, in order to make the journey from the North Atlantic Ocean to Valparaiso, etc., shorter. Thus, the Panama Canal should have the same effect on Western South America as the Suez Canal had upon India, since it saves the long voyage round Cape Horn (p. 219).

SUMMARY.

South America, south of the Equator, resembles in climate and natural vegetation Africa, south of the Equator.

The pampas correspond with the Australian downs.

Chilean minerals,—nitrate and copper,—are obtained near the desert, similarly to copper at Ookiep, in South Africa, and gold at Kalgoorlie, in Western Australia.

EXERCISES.

1. Give, in order, commencing at the north-east, the names of the countries bordering Brazil. Add the name of the capital city of each, and of any important river flowing through the country, or separating it from Brazil. [*N.B.*—Draw a map.] (C.P.)



2. Explain how and why the climate differs in different parts of South America. How, in consequence, do the vegetable productions vary? What are the chief productions of each climatic region? (C. P.)
3. Compare the Amazon and Niger basins in position, relief, climate and economic vegetation. (C. P.)
4. What parts of South America chiefly produce (a) wool, (b) rubber, (c) wheat, (d) sugar, (e) coffee? How do climate and physical features favour the production of each of these commodities? (*C. U. I.)
5. Draw a map of Argentina, showing the main mountain range, the principal rivers and the chief seaports. (Vict. Ed. Dept.)

31. North America.

1. Draw the network shown in Fig. 114. The parallels are circles drawn with the same centre, which lies in the straight line—meridian 100° W.— $\frac{1}{10}$ th of an inch outside the rectangle. The radii of the circles are $\frac{3}{8}$, $1\frac{1}{4}$, 3 , $4\frac{1}{2}$, $5\frac{3}{4}$ inches respectively. The rectangle is $5\frac{1}{2}$ by $3\frac{1}{2}$ inches. The meridians are drawn to converge at the centre.

2. Insert in such a network an outline map of North America: use the method of Fig. 85, and learn how to draw such a map quickly. Insert on your map the tropic of Cancer and the Arctic Circle. Shade the land higher than 3000 feet from Fig. 114.

3. On an outline sketch-map of North America show the prevailing westerly and trade winds. Write the word rainy where you would expect to find a heavy rainfall, and the word forest where you would expect to find that the rainfall favoured a dense growth of trees. Shade lightly the tundra or frozen desert. Write the word arid in the regions where the rainfall is slight, and the word prairies where the natural grass land occurs. Insert from Fig. 59 the district on the sea where ships would be likely to meet ice. Estimate the scale of your map in terms of miles to one inch.

Position.—North America is entirely north of the equator, and the whole of the continent lies within the land hemisphere, so that the coast-line of the Gulf of California is the portion of North America which is most distant from London. The northern coast-line is within the Arctic circle, and Greenland and the islands which make the Canadian archipelago are among the coldest parts of the Northern Hemisphere.

Size, people.—North America is about 20 per cent. larger than South America. It includes Canada and the United States, which are approximately equal in size and which together make up about nine-tenths of the area. The remaining tenth of the country includes Mexico and the Central American States, **Guatemala, Honduras, Salvador, Nicaragua, Costa Rica, and Panama.**

In the Gulf of Mexico lie the West Indian Islands, the largest of which—**Cuba**—is an independent state, and many of which are included within the British Empire as the **British West Indies**. **Jamaica** is the largest British island in this archipelago.



Photo: Underwood & Underwood

FIG. 115.—PEOPLE AND HOUSES IN CENTRAL AMERICA.

Canada is slightly larger than Australia, and contains about as large a proportion of barren land, in the cold wastes of the tundra, which are as useless to man as the sandy waste of the Central Australian desert.

The original inhabitants of North America, the Indians, have almost completely disappeared. A few of them live like some Maoris among the white men in the cities; others inhabit tracts of

country which have been set apart for them, and in this respect resemble some of the natives of South Africa. The chief people of North America are the settlers from Europe or their descendants. Mexico is peopled by Spaniards, but the United States contain the descendants of many English, Scotch and Irish emigrants, as well as many emigrants from Germany, Russia and Central Europe. The population of the country has reached the total of 100 million



FIG. 116.—NORTH AMERICAN INDIANS.

A war party in a Rocky Mountain Indian Reserve. (Note the shape of the "lodges" or tents.)

people from the times of its discovery in the early sixteenth century. Canada contains fewer than ten million people, most of whom inhabit a narrow strip of country which lies along the boundary between Canada and her southern neighbour.

Relief.—The western half of North America is mountainous, and consists of the **Rocky Mountains**, the peaks of which lie in a line parallel to the western coast in the same fashion as the peaks of the Andes. The Andes are, however, nearer to the sea; the Rockies leave room for other parallel ranges between them and the coast,

the chief of which are the **Cascades**. The valleys lie lengthwise parallel to the coast between the ridges. The most noteworthy of these valleys contains the rivers Sacramento and St. Joaquin, which join to enter the sea at San Francisco. Similar valleys have been drowned by the ocean to form the Gulf of California and the Queen Charlotte Sound between Vancouver and the mainland. The 3000 feet contour line (Fig. 114) in the United States on the eastern slopes of the Rockies lies almost north and south along meridian 100° W.

From the Rocky Mountains three great river systems send their waters eastwards. In the north the rivers of the **Mackenzie** system reach the Arctic Ocean. Near the Canadian boundary the **Saskatchewan** system flows eastwards to Lake Winnipeg and onwards to Hudson Bay. Further south the **Missouri** and **Arkansas** flow into the **Mississippi**.

Consequently, the middle belt of the continent is lowland like the middle belt of South America. The water-parting between the Saskatchewan and Mississippi systems is not very high, and the cutting of a shallow canal would lead into the Mississippi the waters of the **Red** river which flows into Lake **Winnipeg** from the south.

Across the wide-spread Mississippi valley, on its eastern margin, are the Appalachian Highlands, which lie parallel to the Atlantic coast, and leave a strip of lowland between them and the coast, which is 100 miles wide at the southern end and narrows towards the north.

In the height of land which lies along parallel 50° there are five shallow but wide depressions which are the Great Lakes, and form the largest lake system in the world. From these five lakes the St. Lawrence river flows to the Atlantic Ocean in a narrow valley, quite the opposite in character to the wide shallow valley of the Mississippi. Between lakes Erie and Ontario occur the Niagara Falls (Fig. 117). The lakes and the St. Lawrence are partially or wholly frozen in winter.

The Central American Isthmus, like most of Mexico, consists of the mountainous highland which connects the Rockies with the Andes, and drops suddenly to the ocean like the plateau of South Africa.

Climates.—The western coasts in the north, in **Alaska** and **British Columbia**, receive the westerly winds from the ocean, and consequently have variable rains, with a larger share of rain in winter than in summer. The eastern coast in the north, in **Labrador**, is cold and frosty: only for a short time during the summer is it

warm enough for vegetable growth ; these shores lack warm westerly on-shore, rain-bringing winds.

Further south, on the west, in California and the neighbourhood, there are the cool wet winters and the hot dry summers which are called a *Mediterranean climate* (p. 67).

Further south still, on the shores of the Gulf of California, the



Photo Underwood & Underwood

FIG. 117.—NIAGARA FALLS IN WINTER.

trade winds blow off-shore, and the region is arid like the western Sahara. The eastern coast has variable winds during the summer (Fig. 60), and off-shore winds during the winter. The summer winds are warm and rain-bringing ; the winter winds are cold and dry ; consequently the eastern coast districts have on the whole summer rains accompanied by high temperatures, and winter dryness accompanied by intense cold. New York frequently has severe blizzards in winter.

The middle lowlands have a climate which is not greatly affected

by the sea. Winds from the west usually come downhill, and are therefore warm and dry. Winds from the north are usually cold and dry; the only warm wind which is wet comes from the south. Southern winds blow more frequently during the summer months; consequently there is most rain during the summer. But on the whole the middle lowland is dry, and during the winter has long periods of dry cold, and during the summer long periods of intense heat. In Canada, the winter cold is so intense that snow lies on the ground for many weeks, and all field work on the Canadian farm is suspended.

The extreme north coast has a climate of Arctic severity; and the coast of the Gulf of Mexico in the south has a climate which resembles the tropical climate that characterises the lowlands of the West Indian Islands and of the Central American States.

Natural vegetation.—The western coast from San Francisco northwards is wet enough to be heavily forested with broad-leaved and coniferous trees. The lumberer is hard at work removing these trees to supply the world with timber. The arid region in the south is characterised by cactus-like plants similar to those of the Sahara and scrub plants similar to those of the Australian desert.

Labrador has tundra; Nova Scotia and the New England States, just south of the estuary of the St. Lawrence, are heavily forested, so that here the lumberer is found at work. The Appalachians used to be forested almost equally thickly, but many of the trees have been cut down. The coastal lowlands gradually become swamplier, until, in the south in Florida, there are stretches of country covered with the luxuriant tangled growth of tropical lands.

The middle lowlands in the north are tundra; further south there is the temperate forest, and still further south occur the grass lands, here called **prairies**. The prairies are vast areas of gently undulating treeless country, where grass is the only vegetation which the scanty rainfall permits.

The Mexican plateau is veld-like; the coast lands are tropical forests like the malarious lowlands of German, Portuguese and British East Africa.

SUMMARY.

The chief fact regarding the relief of North America is the stretch of lowland which occupies the middle of the continent.

Consequently, the effects of the cold climate which prevails along the Arctic shores are felt far south in the United States whenever the winds blow from the north.

Therefore climatically North America contains three regions, the eastern coastal region, the western coastal region, and the middle lowland.

EXERCISES.

1. What are the fundamental features of the climate of North America? And to what causes are they due? (C.P.)
2. Give the situations of the chief mountain ranges of North America. Point out how their positions cause the climate and vegetation of different parts in the same latitude to vary considerably. (C.P.)
3. How does the climate of the *northern* part of North America differ from that of the *southern* part, and the *eastern* side differ in climate from the *western*? How do these differences affect the occupations of the people? (C.P.)



FIG. 118.—CANADA: PROVINCES.

32. Canada.

1. Write a short note pointing out the differences between the climate of British Columbia, Manitoba and Labrador (p. 204).
2. Draw a sketch map of North America. Mark the boundary of Canada, and the Great Lakes, Lake Winnipeg, the rivers St. Lawrence, Nelson, Saskatchewan, Mackenzie, and add their names. Name New-

foundland and Vancouver. Insert Halifax, Quebec, Ottawa, Montreal, Toronto, Winnipeg, Calgary, New Westminster.

3. Draw a sketch map of North America. Mark the Canadian boundary, name Canada and the United States. Shade the tundra and the prairies. Write the word *forest* on your map sufficiently carefully to show all the forest belt. Write a short note on the three great natural vegetation regions of Canada.

The Dominion of Canada.—The Dominion of Canada consists of **Nova Scotia, Prince Edward Island and New Brunswick**, which are the *maritime* states of the east; **Quebec and Ontario**, which are the *states of the St. Lawrence*; **Manitoba, Alberta, Saskatchewan**, which are the *prairie* states; **British Columbia**, which is the *western maritime state*; and the territories which lie along the northern shores, between the states which have been named and the sea. The territories are forest and tundra, and include about 56 per cent. of the area of the Dominion.

The greater number of Canadians live between the boundary of the United States and a line which lies to the north of that boundary and about 10° of latitude, *i.e.* 700 miles, away from it. Effective Canada consists of this strip of land, which is about 700 miles wide and in length about one-sixth of the distance round the earth at that latitude, *i.e.* about 2700 miles.

Climates.—British Columbia is wet, especially in winter, but on the whole it is warm all the year round. The prairie states have cold, frosty winters, when the snow covers the ground for long periods.

The peninsula of Ontario, between lakes Huron and Erie, lies farthest south of any part of the Dominion, and therefore has the warmest climate; Quebec is colder.

The eastern maritime states are wetter and warmer than those on the St. Lawrence. The St. Lawrence is frozen from November to April, and the estuary of the river is approached across that part of the Atlantic Ocean where ice is prevalent throughout the year (Fig. 59).

The differences between the climates of the various states are shown in Fig. 118.

Farming.—Many of the people who inhabit Canada are farmers. In the eastern states up the river from Quebec as far as the Ontario peninsula, the farms are small, and one of the chief products of the farmers comes from the dairy. Canadian cheese is exported from

these portions of Quebec and Ontario in increasing quantities, and forms the chief external supply of cheese for the workers of the United Kingdom. The farmers of both Ontario and Quebec produce some oats, and those of Ontario grow wheat, but the chief production of these cereals occurs on the prairie states. Manitoba and Saskatchewan yield large quantities of oats and wheat.

Ranching is the occupation of most of the people of Alberta, and occupies the attention of the dairy farmers of the St. Lawrence states. Live cattle are sent from the Canadian ranches to the United Kingdom.

Lumbering.—In New Brunswick, in the north of Quebec, and in British Columbia, lumbering occupies many people. In Quebec, most of the work of gathering the timber is done during the winter, when the snow makes it possible for men to move the logs from the forests to the rivers. Elsewhere the work is continuous, and steam-driven machinery is frequently used to drag the logs to the railways. Quebec is a timber port.

Mining.—Many Canadians are miners. Canadians mine about one per cent. of the world's coal, chiefly in British Columbia. Canadian gold-miners work in the **Yukon** district, and further south in British Columbia near **Kootenay** and **Nanaimo**. Near Lake Superior, in Western Ontario, lies the important mining district which includes the iron-ore mines of **Cobalt** and the copper and nickel mines of **Sudbury**. Consequently, the iron and steel works of Canada lie near the mines and near the waterway of the St. Lawrence and the lakes, and the chief centre is at Sault Ste. Marie, familiarly known as **Soo**.

Commerce.—Canada is unable to produce many things which Canadians need, and consequently receives large supplies from the United States and from the United Kingdom. Maize, tobacco, petroleum are obtained from the United States, which also send coal to the prairie states, as well as those iron and steel goods which the Canadians are as yet unable to make for themselves. Textile goods, such as articles of clothing made from cotton, wool, linen and silk, are obtained from the United Kingdom.

In exchange for these things, Canadians export large quantities of wheat, oats, live cattle, cheese and fish almost entirely to the United Kingdom, and send ores of iron, copper and nickel to the United States. Canadians send some coal to the neighbouring portions of the United States which lie close to the mines in New Brunswick.

Fishing.—Most of the Canadian rivers and lakes teem with

fresh-water fish, which are caught for local consumption, but the **Fraser** river in British Columbia is one of the great world sources of salmon, and Canadians send from this river many millions of tins of salmon annually.

In the east, Canadians take part in the fisheries on the Grand Banks of Newfoundland, and many people in the maritime states are fishers of cod.

Towns and railways.—Canada has been populated by emigrants from Europe, and these settlers have gradually spread themselves along the lands near to the southern boundary of the country. Settlers occupied land first near the St. Lawrence, and later in

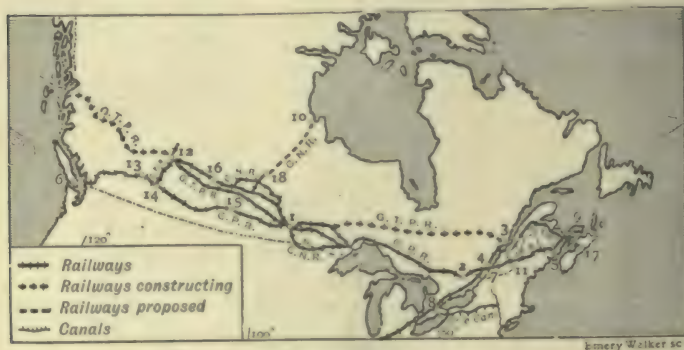


FIG. 119.—THE CANADIAN RAILWAY SYSTEM.

- | | | | |
|---------------|-----------------|--------------|-----------------|
| 5. St. John. | 8. Brantford. | 13. Banff. | 16. Battleford. |
| 6. Victoria. | 11. Sherbrooke. | 14. Calgary. | 17. Halifax. |
| 7. St. Henri. | 12. Edmonton. | 15. Regina. | 18. Le Pas. |

(See Fig. 114 for other towns.)

British Columbia, west of the Rockies. The prairie lands were settled at a still later date. Consequently, the oldest towns are Quebec, Halifax and Montreal. New Westminster is younger, and Winnipeg and Calgary are younger still.

The first line of towns and farmsteads lay along the St. Lawrence and the Great Lakes, but in time communication by water was too slow, and railways were made. Finally, a great project was made to unite the east and west across the scantily peopled prairie by means of a trans-continental railway, and therefore the **Canadian Pacific Railway** (C.P.R.) line was built.

For many years the prairie states developed so slowly that the

C.P.R. and the river and lake steamers were sufficient for their needs. But **Saskatchewan** has recently become populous, and the farmers of that state have found that it was increasingly difficult to get their cereals to market in the same year as they were reaped. From the time of harvest in the autumn until the ice blocked the navigation of the St. Lawrence in November, every railway truck was required to send the cereals to the port on the western end of Lake Superior, **Port Arthur**, soon enough for the ships to take the grain through to Montreal before the ice made water transport impossible. Each year the strain became greater, and each year some of the cereals had to remain stored in great granaries called *elevators* until the ice had melted in the following spring. Consequently, new railway lines have been undertaken, and the *Canadian Northern* and the *Grand Trunk Pacific* railways have been planned and partly built to meet the needs of the settlers who are farming in Saskatchewan.

The St. Lawrence waterway.—The great waterway from Port Arthur to Montreal presents many difficulties to navigation in addition to the annual frost. Where Lake Superior empties itself into Lake Huron occur the rapids or shallows which ships of any size are unable to pass. This obstacle has been obviated by the construction of canals both by Canada and the United States. Fig. 120 is a picture of a cargo-boat being loaded with grain at an elevator.

Between Lakes Erie and Ontario occur the **Niagara Falls**. This obstacle has been overcome by the construction of the **Welland Canal**. Between Lake Ontario and Montreal the river is shallow, and the Lachine rapids cause ships to traverse the **Rideau Canal** which has been made for their use.

Montreal and New York.—The coast of the north-east of the United States lies roughly parallel to the St. Lawrence, and between the coast and the river valley lies the highland which is the northern continuation of the Appalachian mountains. This highland is a barrier which is about 700 miles wide. The highlands are forested and scantily peopled, and communication was and still remains difficult. There is only one easy route through from the coast to the St. Lawrence: it commences at the mouth of the river Hudson, and passes up this river to Albany. At Albany there is a choice of routes—one due north to Lake Champlain and on to the St. Lawrence, the other due west up the valley of the Mohawk river to Lake Ontario. This easy route has determined almost entirely the

situation of many towns both in Canada and the United States. New York lies at the sea end of the route, and Montreal lies at the river end of the route by Lake Champlain.



Photo Underwood & Underwood

FIG. 120.—LOADING A "WHALE-BACK" SHIP WITH GRAIN AT AN ELEVATOR.

SUMMARY.

Canada produces timber, furs, fish (collecting industries), gold, copper, coal (extracting industries), wheat, meat, butter and cheese (agriculture).

Effective Canada is long and narrow, hence railways and waterways are most fully developed from east to west.

EXERCISES.

1. Describe the physical formation of Canada, between the Rocky Mountains and the great lakes. What provinces are included in this region, and what are the chief occupations of the people? (*O.U.L.)

2. Name the principal localities in Canada (two for each product) from which (i) timber and (ii) wheat are obtained. Also give the position of the following places, stating for what each is noted: Caigary,

Halifax, Montreal, Port Arthur, Quebec, St. John's, Vancouver, Toronto, Sudbury. (*C. U. L.)

3. Draw a map of Canada. Show thereon the chief rivers, two chief mountain masses, the location of the chief industries, the four principal towns. (Vict. Ed. Dept.)

4. What do you understand by "the Dominion of Canada"? What route would you take if you wished to travel from England to Manitoba? How could you go on to India without coming back to England? (C.P.)

33. The United States.

1. Make diagrams to illustrate the rainfall values given below. What type of rainfall does each town illustrate?

		SEASONAL RAINFALL (PERCENTAGES).			
		Spring.	Summer.	Autumn.	Winter.
Los Angeles	-	25	—	19	56
St. Louis	-	27	32	22	19
Charleston	-	21	35	25	19



FIG. 121.—THE UNITED STATES.

2. Make a traced map of the United States from Fig. 121. Mark the navigable portion of the Mississippi river and its tributaries. Mark the

situation of Pittsburg, Minneapolis, St. Louis and New Orleans, and write a brief account of the situation of each town with regard to internal water communications. Compare the valley of the Ohio with that of the Arkansas under the heads relief, climate, natural vegetation and population.

Climate and vegetation.—Like Canada, the United States has three climatic divisions. The west coast is rainy, especially during the winter, in the north ; and arid in the south near the Mexican boundary. Consequently, the slopes of the Rockies and the Cascades are forested (Fig. 62).

The east coast is wet all the year round, but, like Natal, has most rain during the summer ; e.g. **Charleston** (p. 209). Consequently, the slopes of the Appalachians, are or were forested, and the lowlands are extensively tilled.

The middle states, which lie in the Mississippi lowland, have a climate which varies greatly from winter to summer ; that is, a continental climate: the summers are hot and the winters are cold or cool. Whenever the wind blows from the north there is a sudden drop in the temperature, and with such winds farmers on the prairies frequently experience sudden spring frosts.

The lowlands of Texas and Arizona are arid.

Basin of internal drainage.—The Great Salt Lake is the centre of a depression between the main peaks of the Rockies and the main peaks of the Sierra Nevada, further west. The lake is about 4000 feet above sea level, and the whole region is elevated, wind-swept and arid. Consequently, sheep rearing is the chief occupation of the people who have settled near the lake in the states of Utah, Idaho and Wyoming.

The West Coast States.—Washington and Oregon resemble British Columbia ; the people are lumberers on the mountain slopes and farmers on the flat lands along the river valleys. The **Columbia**, like the Fraser, is an important centre of the salmon fishing industry. The chief port of the district is **Puget Sound**, which shares the export trade of the western states with San Francisco.

California is the garden state of the west. It has a Mediterranean climate, and produces wheat, lemons, apricots, peaches, raisins and currants, most of which are sent to the eastern states. San Francisco is the largest city on this coast and the chief port.

Puget Sound and Portland on the Columbia are termini of the *Northern Pacific Railway* from New York *via* Chicago.

San Francisco is the terminus of the *Central Pacific* from New

York *via* Pittsburg, Chicago and Omaha, or *via* Pittsburg, Cincinnati, St. Louis and Kansas City.

San Francisco is also the western terminus of the *Southern Pacific* from New York, *via* Vicksburg or New Orleans (Fig. 124).

These trans-continental railways have been necessary because San Francisco could only communicate by sea with New York *via* Cape Horn, which makes a sea voyage of over 13,000 miles.

It is expected that the Panama Canal will lead to increased traffic to San Francisco by ship, since the distance of that city from New York is now reduced to about 5000 miles, which will make the journey less than half as long, and will obviate the stormy passage round Cape Horn.

The States west of the Mississippi.—Between the coast states and the Mississippi there are two groups of states, the *upland states*, Montana, Idaho, Wyoming, Nevada, Utah, Colorado, Arizona and New Mexico; and the *slopes states*, North and South Dakota, Nebraska, Kansas, Oklahoma and Texas.

The **upland states** are scantily peopled, for the chief occupations of the people are sheep-rearing and mining. Sheep-rearing causes men to spread themselves over the upland valleys and slopes, and mining only brings men together in scattered mining camps where the minerals have been discovered. The chief minerals produced are silver, gold, copper and lead : **Denver** is perhaps the best known mining centre.

The **slopes states** contain the prairies, and therefore the settlers are both arable farmers and ranchers; consequently, the population is denser than on the uplands. Kansas and Nebraska are the great ranching states, and contain large numbers of cattle and horses; so that Kansas City and Omaha are important centres of the meat-packing industry, in which the live cattle are transformed into canned food for export to all parts of the world.

The Dakotas in the Missouri valley are the cereal states, since North Dakota produces much wheat and South Dakota grows much barley.

Maize is a most important farm product of the United States, which grows about three fourths of the world's supply of this cereal. Maize requires a warmer climate than wheat or barley, and consequently Kansas and Nebraska are important growers of maize, as they are hotter than the Dakotas. Maize is much used for fattening pigs, and these states rear many pigs, which are used as food supplies in the great meat-packing centres.

The Mississippi States.—The Mississippi is a boundary between states almost throughout its course. Minnesota, Iowa, Missouri, Arkansas, and Louisiana lie on the west, and Wisconsin, Illinois, Kentucky, Tennessee and Mississippi are on the east.

Since these states stretch the whole length of the river from north to south, Louisiana, for example, has a much hotter climate than Minnesota, consequently the northern group down to Missouri and the Ohio river belong to the cereal states, and the southern group belong to the cotton states.



Photo Underwood & Underwood

FIG. 122.—LOADING COTTON ON A MISSISSIPPI STEAMBOAT.

The Ohio States.—The slight upland which lies between the Great Lakes and the Ohio river includes Michigan, Indiana and Ohio. These states belong to the cereal belt, and are naturally grouped with Illinois and Iowa.

The North Atlantic States.—From the north-east coast inland to the Canadian boundary across the Appalachians lie the states of Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania and Maryland. These states are the most important in the Union, and are in the same latitude as the cereal belt, but the people are miners, manufacturers, fishers and traders as well as farmers.

The South Atlantic States.—Virginia, West Virginia, North and South Carolina, Georgia, Alabama, and Florida are the south Atlantic states, and belong to the cotton states.

The Cotton States.—With a hot climate and a good rainfall, due to their proximity to the sea—either the Atlantic Ocean or the Gulf of Mexico—the cotton states are not fitted to produce cereals, but are the world's chief sources of tobacco and cotton. Kentucky, Virginia and North Carolina produce almost one-third of the world's

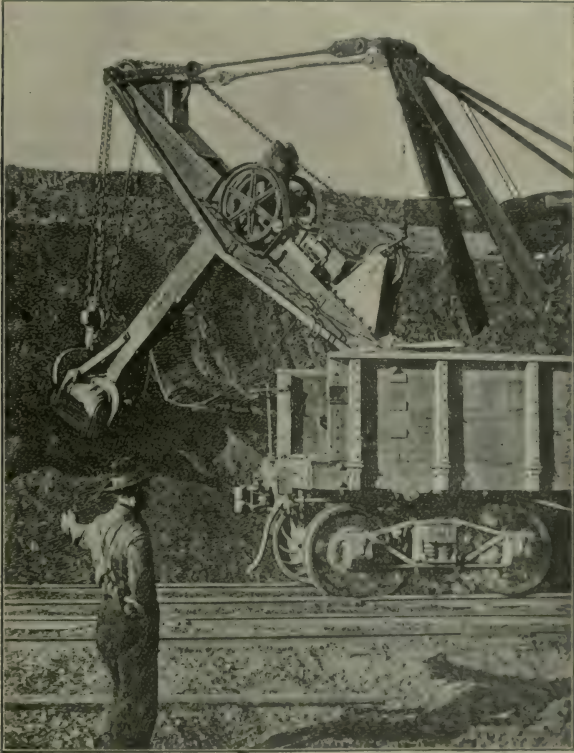


Photo Underwood & Underwood

FIG. 123.—QUARRYING IRON-ORE NEAR LAKE SUPERIOR.

(Note the fact that the rock is quarried by machinery.)

tobacco, which is therefore of prime importance to the inhabitants of Richmond and Baltimore, the chief towns. Cotton, further south, is grown in those states which border the ocean (except Florida), to so great an extent, that three-fifths of the world's supply is

there produced. Nearly three-fourths of the cotton used in the cotton mills of Great Britain come from this district. The cotton which is exported is sent from the Gulf ports of Galveston and New Orleans and from the Atlantic ports of Savannah and Charleston to a smaller extent, while some of it is sent by rail to New York to be exported thence.

The Cereal States.—The United States produce about one-fifth of the world's wheat and about one-fourth of the world's oats. Oats can be grown in a colder climate than wheat, and are chiefly grown near the Great Lakes in Wisconsin and Minnesota. Wheat is grown further south in Ohio and Indiana, as well as in Dakota, Kansas and Nebraska. Cattle and pigs are reared in the states near St. Louis and Chicago.

Chicago.—Fig. 124 shows how the trans-continental railway lines converge on Chicago, which lies at the southern end of Lake Michigan, and has therefore water communication with Lake Erie. Consequently, this city is the greatest wheat and meat centre in the world.

The Manufacturing States.—The United States mine about one-third of the world's coal, chiefly in Pennsylvania and Ohio. Illinois produces large quantities of petroleum, and the coal areas provide large supplies of natural gas. Iron ore is mined to the extent of about one-third of the world's supply near Lake Superior in Minnesota and Michigan. Consequently, the states of Pennsylvania and Ohio are the centre of an iron manufacturing district which produces about two-fifths of the world's pig iron and steel. Pittsburg is the centre of this district. Iron ore is brought by boat to Lake Erie, Cleveland, and then by rail to **Pittsburg**; coal is sent from the mines in the locality; and many railway lines connect Pittsburg with New York.

New York and the Atlantic towns.—Fig. 125 shows the admirable situation of New York in relation to the one easy route by the Hudson across the Appalachian barrier. The one great canal, the Erie Canal, connects the Hudson navigation at Albany with the navigation of the Great Lakes.

Boston is not so well situated; there are no easy lines of communication westward. Baltimore and Philadelphia lack similar facilities westward, and have not such an easy access to the Atlantic Ocean as New York. Consequently, New York is the largest city and the greatest seaport of the United States.

New York does almost half of the total trade by sea of the United



FIG. 124.—UNITED STATES RAILWAYS AND WATERWAYS.

(Note the Fall line which connects the places on the east coast rivers where rapids interfere with navigation.)

1. Philadelphia. 8. Vicksburg. 11. Pittsburgh. 13. Cleveland. 16. Kansas City. 18. Minneapolis. 20. Galveston.
 2. Baltimore. 9. Cincinnati. 12. Buffalo. 14. Detroit. 17. Omaha. 19. Duluth. 22. Portland.

(For other towns see Fig. 114.)

States. This great port has a greater trade with the United Kingdom and Germany than Boston, Philadelphia or Baltimore. It has a greater trade with the West Indies and the Central American countries than New Orleans; it is the chief port in the United States for trade with the Atlantic ports of South America, and does the bulk of the trade with Australia, China and the East Indies.

The United States as a whole.—Because the United States produces such large quantities of cotton, wheat, meat and iron goods, there is a surplus of these articles which must be exported. In exchange for these exports the United States has to buy many articles from the rest of the world. These imported articles consist of two groups; first, those which the country does not produce at



FIG. 125.—THE SITUATION OF NEW YORK.

all; and, secondly, those which the country does not yet produce in sufficient quantities.

The chief articles in the first group are such tropical products as teak, rubber, tea, coffee and silk; and such minerals as tin and nitrate, which are not mined in the Union.

The chief articles of the second group are wool, as the Union rears comparatively few sheep; copper and lead, of which the local supplies are insufficient; and textile manufactured articles, such as woollen and cotton clothing, of which the manufactures are not yet sufficiently developed.

SUMMARY.

The United States include a western area for lumbering and fruit growing ; a middle western area for mining and ranching ; a middle eastern area for farming ; and an eastern area for farming and lumbering.

Manufacturing is localised on the line of communication from Chicago to New York, viz. the Ohio, Mohawk, Hudson route.

EXERCISES.

1. Describe the geographical conditions which have made New York the largest city on the Atlantic coast of North America. (*O. U. L.)

2. What are the chief natural obstacles to communication between the Atlantic coast lands and the Ohio Valley ? In what districts is the separation most complete ? How has this isolation affected the population and industries of these states ? (*O. U. L.)

3. Show on a sketch map the routes from New York to Montreal and Buffalo. Insert these three cities, Albany and Syracuse, and the chief rivers and lakes. (*O. U. L.)

34. The Rest of North America.

1. Make a traced map from your atlas of the Gulf of Mexico to show Mexico, Panama and the West Indian Islands. Name Cuba, Jamaica, Trinidad, the Bahamas, Barbados and Honduras. Insert and name Mexico City, Havana, Belize and Kingston (Jam.).

2. Write a short note on the products of the tropical forests of the Central American countries.

3. Examine Figs. 59-60, and write a short note on the climate and situation of Newfoundland to show how these affect the occupations of the people, *i.e.* lumbering and fishing.

Newfoundland.—Newfoundland lies off the mouth of the river St. Lawrence ; it is roughly triangular in shape, and the length of the southern and western arms of the triangle is about 300 miles, which is about the distance in a straight line from Land's End to Dover. The middle portions of the island consist of upland, and the coastal plains are frequently about 100 miles wide.

Stretching south-eastwards lie the Grand Banks, which are a wide stretch of land rising almost to sea level.

The land is extensively forested, and many of the people are lumberers.

The climate of the island is on the whole so cold that the trees

are usually not fully developed, and consequently can only be used for the production of wood pulp.

But the main industry of the Newfoundlander is that of fishing. The shallow waters of the Grand Banks make an excellent feeding ground for cod and halibut, and these waters are fished regularly by fishermen from Newfoundland, Canada, the United States, and from France and England.

The Grand Banks lie in the area which has been noted in Figs. 59-60 as a district where ice is encountered frequently. The ice is brought down to the Grand Banks by a current of cold water, and in the neighbourhood of the south-east corner of the Banks this cold water is met by the current of warm water which flows north-eastward from Florida, and is known as the Gulf Stream. The warm water affects the winds which blow over it, and makes them wet and warm ; the cold water then chills the air, and consequently the district is noted for the prevalence of mist and fog.

Ships from England to New York pass close to the Grand Banks, because they find that a voyage further south is longer ; consequently, the fishing fleets on the Banks have three regular dangers :— (1) the danger of the ice ; (2) that of the fog ; (3) that of the ocean liners, which come upon the fishing vessels suddenly out of the fog.

Despite these dangers the industry increases, and the neighbouring shores of Newfoundland are used for the establishments in which the cod are prepared for sale, and in which the cod liver oil is manufactured.

Labrador is the name given to the strip of coast land which lies to the east of Canada ; it forms part of the state of Newfoundland. The land is tundra, and the people are Eskimos.

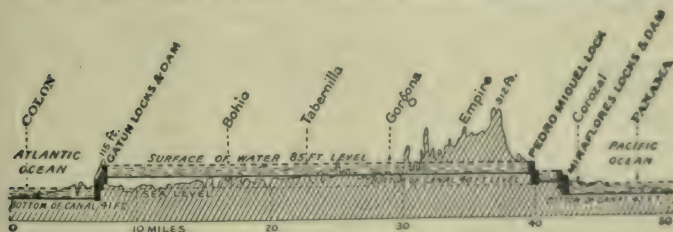
Mexico.—From Panama to the United States the whole stretch of isthmus consists of upland, which almost reaches from the east coast to the west coast, leaving only narrow strips of coastal lowland on each side.

On-shore winds cause the coastal lowlands to be damp and forested, but the upland and mountainous interior is arid.

Mexico is the largest of the lands which are situated on this isthmus. It is about seven times as large as New Zealand, and has a population of about 15 million people, many of whom are half-breeds.

The chief industry is mining. Mexico is the largest silver-producing country in the world, and in addition mines about one-

fifth of the world's copper, as well as considerable quantities of gold, lead and zinc.



The Vertical Scale is exaggerated 100 times.

FIG. 126.—THE PANAMA CANAL.

(Note the locks at the ends of the Canal: there are no such locks on the Suez Canal.)

The chief port is **Vera Cruz** on the Gulf of Mexico, from which a railway line climbs to the capital, **Mexico City**, on the upland. From Mexico the railway runs northwards to join the railway system of the United States.

The other states of the isthmus are Guatemala and British Honduras, Salvador and Honduras, Nicaragua, Costa Rica and Panama.

All these countries are small and contain comparatively few people, whose main business is agriculture and lumbering. Some coffee, maize and bananas are grown, and some rubber and mahogany are obtained from the tropical forests.

The West Indies.—The West Indian Islands usually have upland interiors and coastal plains. Much of the natural forest vegetation has been cleared away for the plantations of sugar and bananas and other fruits such as limes and pine apples.

The original population which Columbus found in these islands when he discovered America has died out, and the majority of the people are the descendants of the West African negroes who were brought over to the West Indies as slaves to work the plantations in the seventeenth and eighteenth centuries. The freed or free negro is not industrious, and in **Haiti**, where there is a State entirely administered by negroes, there is an example of one of the least civilised States in the world.

Cuba.—The largest island is Cuba, which was formerly a Spanish colony, but is now independent. The island produces large quantities of cane sugar and tobacco. Pine apples, bananas and coconuts are grown and exported in large quantities. Cedar wood and mahogany are obtained from the forests. The chief town and port is **Havana**.

The British West Indies.—Jamaica, Trinidad, Barbados, the Bahamas and the Leeward Islands form part of the British Empire, and produce cane sugar, bananas, limes, cocoa, coconuts and copra. Many of the people are of British descent, their forefathers having gone to the West Indies to manage the sugar plantations. In those early days, more than fifty years ago, the cane sugar produced in the West Indies was of great importance, but since Western Europe has produced sugar from the sugar beet, the sugar industry of the West Indies has declined in importance.

Trinidad has a lake of asphalt, and sends large quantities of this article to the United States.

Volcanoes.—Because the West Indies are islands, and because the isthmus of Central America is so narrow that no part of it is far from the sea, this district is notable for its volcanic activity. There

are many active volcanoes, and occasionally one of these erupts with great violence, as in the case of Mt. Pelée, and causes great destruction of property and loss of life. The islands contain large areas of volcanic soil.

The Bahamas, as well as the outlying Bermudas, are many of them of coral formation, like some of the islands of the Pacific Ocean. The remains of coral animals make reefs of limestone material near the surface of the ocean, and so islands are formed, and small islands grow larger.

SUMMARY.

Mexico is an arid plateau, and hence the chief occupation of the people is mining.

The West Indies produce tropical fruits and tropical timber.

The British West Indies used to grow sugar canes extensively, but now the inhabitants produce bananas and coconuts.

EXERCISES.

1. State (i) why San Francisco has become the greatest port of the western coast of the United States; and (ii) what are the regions of North America in which the following commodities are produced in large quantities: tobacco, timber, wheat, maize, silver? (*C. U. L.)

2. (i) Explain briefly the commercial importance of the Panama Canal; (ii) state what are the chief industries of Mexico and who are its inhabitants; and (iii) state which parts of North America produce bananas, cotton, silver, nickel respectively. (*C. U. L.)

TEST PAPER.

1. Compare Africa with South America (*a*) in general structure and (*b*) in climate. (C. P.)

2. Draw an outline map of North America, and insert, with names, (*a*) the boundaries of the United States, (*b*) three chief rivers, (*c*) three chief mountain ranges.

Mark the principal manufacturing districts by the letter *I*; the coal-mining districts by the letter *C*; the districts where minerals other than coal are mined by the letter *M*; and particularly dry regions by the letter *D*. (C. P.)

3. State and account for the characteristics and the distribution of the natural grass land in the Americas. (C. P.)

4. Describe carefully the positions of *two* of the following towns, and point out any geographical conditions which have helped to make them important: Boston, Philadelphia, Vancouver, Halifax, Quebec. (*O. U. L.)

or

Describe carefully the position of Montreal, and give the routes by which it is approached from the Atlantic Ocean at different periods of the year.

(O. U. L.)

SECTION IV. ASIA.

35. Asia.

1. Make a tracing of the outline of India from Fig. 127. Insert on your map parallels 10° , 20° , 30° N., and meridians 70° , 80° , and 90° E. Learn from this tracing how to make a map of India from memory.

2. Make a tracing of the map of Asia from Fig. 127. Shade the land which is higher than 3000 feet above sea-level.

Mark the *tundra* by its name, show the *temperate forests* by vertical lines, and write the word *monsoons* across the south-eastern part of Asia where they prevail (Chap. 11).

Asia: relief.—North of India, north-eastwards and eastwards from China, Central Asia is upland. This elevated region forms the widest and largest upland area in the world. The map (Fig. 127) indicates that this upland is higher than 3000 feet above sea-level, but large portions of it are more than three times as elevated, as the map shows. Much of **Tibet** is about two miles above sea-level. From the most elevated upland plains rise mountain ranges, several of which are from two to three miles higher than the surrounding land. The most notable mountain range is the **Himalayas**, which stretch for more than 1000 miles along the north of India. These mountains rise four to five miles upwards from the lowlands of the **Ganges** valley, but on the Tibetan side they rise only from two to three miles above the level of the valley of the **Brahmaputra**.

Part of this mountainous district has been surveyed by Indian surveyors (Fig. 133). The central highland is continued westwards through **Persia** to **Asia Minor**, which is an elevated upland region with narrow coastal plains like Mexico. Another continuation of the highland stretches southwards to form the **Malay Peninsula**, which ends almost on the equator at **Singapore**.

The highland is also continued towards **Bering Strait** by upland





which separates the valleys of the **Lena** and its tributaries from the Pacific Ocean, so that the rivers must send their waters to the Arctic Ocean.

Korea is a peninsula which resembles Asia Minor in its upland interior. Between the **Yang-tse** and the **Canton** rivers, southern China is upland; and the southern portion of India, the **Deccan**, is a triangular peninsula, which consists of upland, and has a mountainous range on the west near the coast, the **Western Ghats**.

The great central highland slopes gradually downwards to the Arctic Ocean, so that **Siberia** is a lowland country.

The remaining lowland of Asia consists of the flat valleys of the **Euphrates-Tigris** (Mesopotamia), which flow into the Persian Gulf, of the **Indus** and its tributaries (Panjab), of the **Ganges** and its tributaries (Doab),* of the **Yang-tse** and the **Hoang-ho** in China, and of the **Amur** in Siberia.

Rivers.—The great rivers of the Siberian plain, the **Ob** and the **Yenesei**, resemble the Mackenzie, as they are all lowland rivers which are almost useless to man, because their mouths are in the Arctic Ocean.

The **Ural** flows into the Caspian Sea, which is a basin of internal drainage. **Lake Aral** also has no outlet, and receives the waters of two large rivers which rise in the central highlands. These rivers therefore resemble the rivers which flow into Lake Eyre in Australia. The **Euphrates-Tigris** and the **Indus** resemble the Nile. All these rivers flow through a lowland where there is a scanty rainfall. Some of the Asiatic rivers change their bed in times of flood, and in many cases man has to erect large irrigation works to hold back some of the flood water, so that he may lead it by means of irrigation channels into his fields to water his crops.

The **Indus** obtains a steady supply of water from the melting snows of the Himalayas, and during the monsoon period the rain which falls on the southern slopes of the Himalayas floods the river regularly.

The **Ganges** rises in the Himalayas, and is fed by the melting snows and by the monsoon rains. The **Brahmaputra** is the river of Tibet; most of the way it flows along the elevated Tibetan plateau, between the mighty range of the Himalayas to the south and the equally mighty, and almost equally elevated, range of the **Trans-himalaya** to the north.

* Mesopotamia and Doab mean "the country of the two rivers," Panjab means "the country of the five rivers."

In the north-east corner of India, and in the neighbouring parts of China, there is a region which has been only slightly explored. Travellers find that a journey in this district presents tremendous difficulties. The rivers **Irrawady**, **Salwen**, **Mekong** flow in narrow steep-sided parallel valleys in the southward continuation of the central highland. At their mouths these rivers make wide flat lands, across which the waters meander in the form of a delta to the sea.

The Yang-tse, the Hoang-ho and the Canton are the rivers of China. Near the highland the valleys are steep-sided and narrow; nearer the ocean the valleys open out to make lowlands, and consequently the rivers are flooded when the return of summer warmth melts the highland snows and fills the valleys to overflowing. On the lowlands, the floods rise level with the banks of the river; and the **Hoang-ho** has frequently broken through its banks, and at one time its mouth lay about half-way between the present mouth and that of the Yang-tse.

The islands.—Off the coast of Asia there are three festoons of islands. In the north the peninsula of **Kamshatka** is continued by the festoon of the tiny **Kurile Islands**. Further south **Sakhalien** and the islands of **Japan** form a second festoon, where the highlands in the centre of the islands are parallel to the highlands which lie near the coast on the mainland (Fig. 127). Further south still there is the festoon which starts at **Formosa** and continues in the **Philippines** to **Borneo**.

The islands of the **East Indies** lie in two lines eastwards from near Singapore. The northern line starts from Borneo, through **Celebes** to **New Guinea**: the southern line includes **Sumatra**, **Java**.

Climate and vegetation.—The central highlands make the climate of Asia. They cause the monsoons (Chap. II), which are the most important feature of the climate of India, China and Japan. The highlands are arid, and contain the desert of Gobi, which is hot in summer and cold in winter.

They keep the warm winds from the Indian Ocean away from the Siberian lowlands, so that Siberia contains the coldest place in the world. The Siberian tundra is the coldest land near the Arctic Ocean, and is probably colder in winter than the North Pole, and as cold as the interior of the continent of Antarctica.

Because of the central highlands, the winds that reach Persia and Arabia are always dry, and these regions are either desert or arid.

The East Indian Islands, **Ceylon** and the Malay peninsula are so close to the equator and so near to the ocean that they alone escape the effect of the central highlands : they have the constant rainfall and great heat throughout the year which is characteristic of all the equatorial regions.

The central highlands are desert or scrub grass land. The northern slopes and lowland are grass lands, like the prairies—they are called *steppes*—where it is hot during the summer. Forest or tundra occurs in the colder areas to the north.

The monsoon lands have tropical forests on the mountain slopes as in **Burma**, and tropical forest or jungle on the uncultivated lowlands near the river deltas, as in the **Sunderbunds**, near the mouth of the Ganges. Elsewhere man cultivates the lowlands and produces the world's crops of rice.

The people.—Most of the people of Asia, in the east and south-east especially, are **Mongols** (Fig. 4). In India and Persia there are people who are allied to the Europeans. In Malaysia and the East Indies there are people who are allied to the South-sea Islanders.

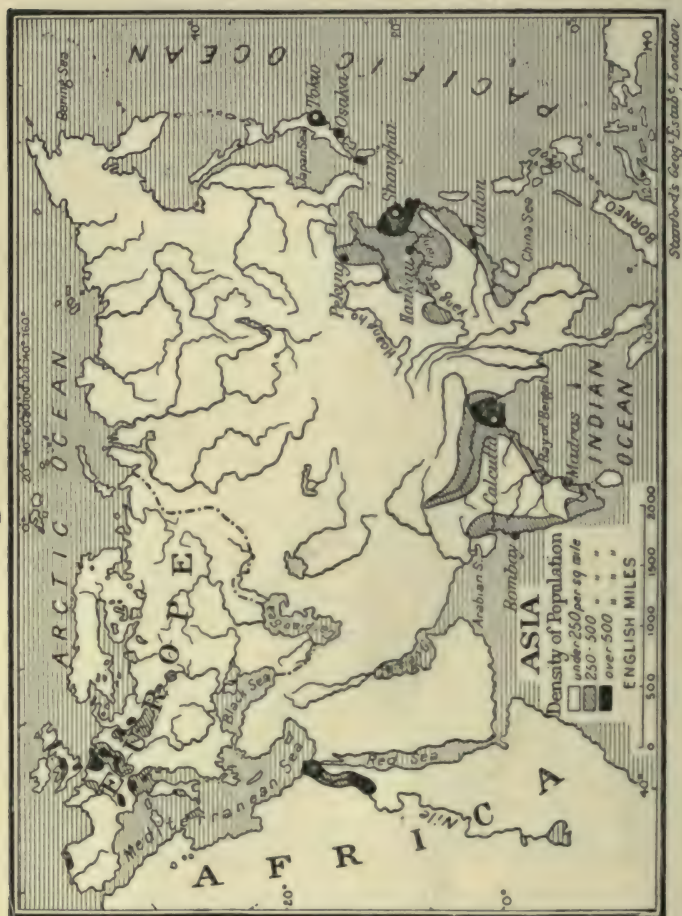
Dotted about Asia, particularly in India, there are a few Europeans, probably not more than a million all told. The Europeans live in these countries chiefly for trading purposes, though some are missionaries, and in India many are government officials.

The real Asiatic is poor, and lives by cultivating the soil for his own benefit and for his own livelihood. Under the guidance of Europeans he tills the ground to produce wheat, tea, rice, rubber, for sale to the people of Western Europe ; but on the whole the work of the 700 million Asiatics is self-centred, and does not yield produce for the consumption of people who live in other lands. The native of Asia is isolated from the great world which lies outside the "unchanging East."

Most of Asia contains few people, but the population is very crowded near Calcutta, Shanghai, and Tokio (Fig. 128).

SUMMARY.

No mountain mass in the world is so stupendous as that of Central Asia. No mountain mass has such far-reaching effects. In conjunction with the Indian Ocean the central highland causes the monsoon winds, on which depends life itself for the millions in Egypt, India and China.



Standard's Geog. Estate, London

FIG. 128.—ASIA : POPULATION.

(Compare this map with Fig. 126 and note that the population is densest on the warmer lowlands.)

Secure in the regularity of his rainfall, the native of India, or China, tills his patch of ground with all the care which a gardener bestows on an English garden. He grows his own food.

Mighty rivers flow from the central highlands in all directions. The Ob is used for navigation ; the Yang-tse leads the sailor into

the heart of China ; the Ganges pulsates with the life of India, and pilgrims regularly visit the venerated stream.

Man harnesses the mighty waters till the Panjab and the Doab yield abundant crops.

EXERCISES.

1. Name the four Asiatic rivers indicated as follows :

- (i) the western river of the Siberian plain ;
- (ii) the great highway of Central China ;
- (iii) the twin rivers of Mesopotamia.

Describe briefly the nature of the country traversed by each—as mountain or plain ; forest, grass land or desert.

Are there any natural hindrances to navigation which affect the usefulness of any or all of them ? (*C. U. L.)

2. Describe carefully the position* and character of the great mountain ranges which form the “backbone” of Asia. (C. P.)

36. India.

1. Trace a map of India from Fig. 130. Trace the rivers and add their names on your map. Insert Calcutta, Bombay, Madras, Karachi, Rangoon, Delhi, Peshawar, Darjiling.

2. Make a map of India from Fig. 129. Insert on your map arrows to show the direction of the south-west monsoon winds : shade the parts of India which receive a heavy monsoon rainfall. Write the word *arid* in the arid region of Rajputana.

Size.—India is about half the size of Australia, and contains about six times as many people as there are in the British Isles.

Relief.—India may be considered to consist of three portions :—(i) along the northern frontier, the steep slopes of the Himalayas ; (ii) the lowland of the Indus and Ganges, sometimes called the *Indo-Gangetic plain* ; (iii) the southern peninsula, the Deccan.

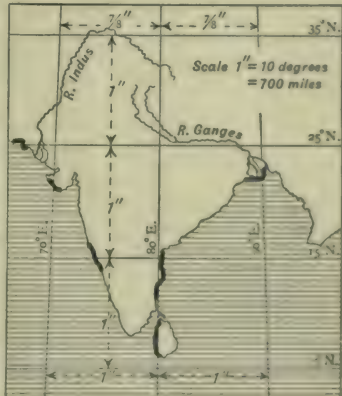


FIG. 129.

The slopes of the Himalayas drop somewhat suddenly from a height of about five miles above sea-level to the Ganges lowland,

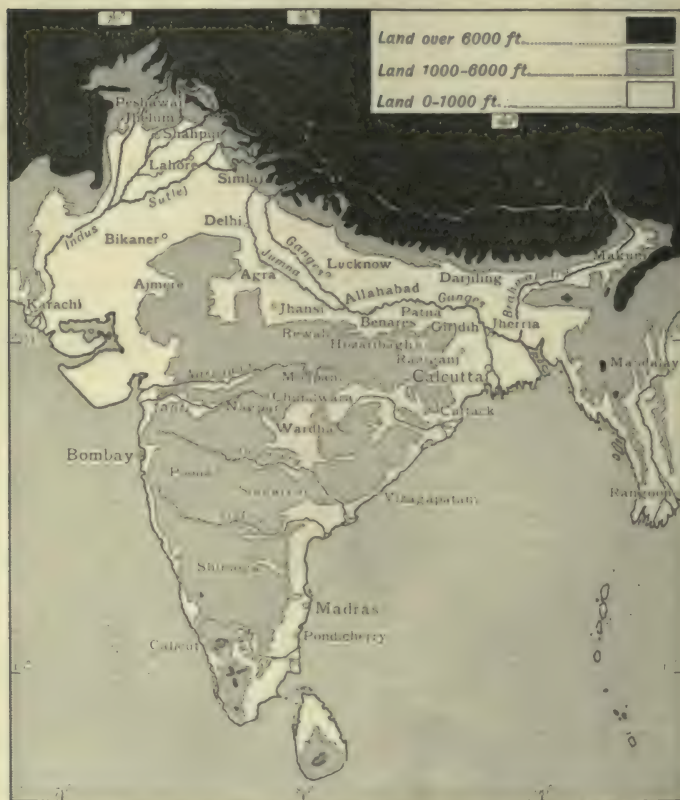


FIG. 130.—INDIA: RELIEF.

(Note the difference in elevation between India north and south of the Indo-Gangetic lowland.)

which is not higher than one-eighth of a mile above sea-level. In the north-east corner the Himalayas approach the mountains of **Burma** so closely that the valley of the Brahmaputra is a steep-sided defile or trench. In the north-west corner the slopes are least steep, and

consequently travellers have always been able to make their way to or from India by a journey through **Kashmir**.

The **Deccan** is highest on the west, and slopes gently towards the east coast. There is a narrow coastal lowland on the west, and a wider lowland on the east coast. Most of the rivers flow eastwards, and have their sources near the west coast and their mouths on the east: only the Narbudda and the Tapti flow westwards.

Ceylon is low in the north and upland in the south, and from the upland rises the mountainous mass of **Pedrotalagala**.

Climate.—India has a monsoon climate (Chapter II). There are heavy summer rains on the Western Ghats and on the Himalayan and Burmese slopes; less heavy summer rains on the Deccan, and scanty rains in the arid region of Rajputana. The coastal lowland from Madras southwards and the lowland in the north of Ceylon have autumn rains with the north-east trades. South Ceylon has tropical rains.

The whole country is hot, with a temperature during most of the year of at least 70° F., except on the high portions of the mountains (Figs. 130 and 58).

Vegetation.—Jungle vegetation with evergreen forests covers the coastal lowlands of the Deccan and Burma. The Deccan upland and the Burmese mountains have extensive forests of teak, and the colder mountains are covered up to a certain height with coniferous and deciduous trees, such as those of the temperate forest; beyond these trees is the perpetual snow.

The Indo-Gangetic plain is treeless on the east, because the land is thoroughly cultivated, and arid on the west.

People.—The majority of the people of India live upon the land. They are settled in villages, or small towns, and live in clusters of small houses made of sun-baked clay, built upon the bare ground. These houses are of one storey, with at most two rooms, and openings in the walls as windows. There are no doors; a curtain of interlaced bamboo suffices. Each household cultivates a small plot of ground with exquisite care, and, provided the rains come at the regular season, sufficient food is grown for the family. The native foods are rice, millets and sorghum.

Many of the villagers pass their lives within a radius of at most ten miles from the village, and many have never seen a railway train, and in some cases have never seen a European. Some of the men in the village are held in great repute, as they have made a pilgrimage along one of the great trunk roads of India, either to the

holy river Ganges in the case of the Hindoos, or to a coast port for the voyage in a pilgrim ship to Mekka in Arabia in the case of the Muhammedans.

A small minority of the people of India are interested in the European and his ways. In some cases they act as his servants, in others they work under his direction in the plantations, and in other cases they work for him in coal mines or in factories. But the bulk of the people are self-centred and indifferent to the doings of the people in other parts of the world. They are not even aware of the events which happen in remote parts of their own country, unless some extraordinary happening is whispered from bazaar to bazaar, when knowledge of it spreads throughout the land with a rapidity rivalling almost that of the electric telegraph.

Crops.—**Rice** is grown on the lowlands of India, wherever water can be obtained in sufficient quantities. The chief crops are grown in Burma and on the lower portions of the Ganges and Brahmaputra, and on the lowland of Madras. **Cotton** is grown chiefly in Bombay.

Wheat is grown as a winter crop in the semi-arid districts round the water-parting between the Indus and the Ganges in the Indo-Gangetic plain.

Jute, which is used for sailcloth and coarsely woven fabrics such as canvas sacking, is the product of the hot wet lowlands of the Ganges delta. **Indigo**, a plant which yields a dye, is grown in Madras and Bengal. **Cane sugar** is produced in the Doab and the lower Ganges valley. **Tobacco** is produced in the rice growing districts, and **tea** is grown on the slopes of the mountains in the Brahmaputra valley and in Ceylon.

Animals and irrigation.—The careful cultivation of the ground which prevails among these patient people is helped by the use of the slow-moving, patient, draught animal, the bullock or buffalo. India contains more of these animals than any other country in the world, but, unlike the cattle of Argentina, the cattle of India are not intended for the production of meat; they are beasts of burden.

The water supply is the cause of much anxiety. In many districts the rainfall does not suffice for the great cultivation, and a system of wells and tanks has been instituted to store water. This system is in use in the arid region of the lower Indus valley, in Madras, and in the neighbouring native state of Mysore. In the Doab and the Panjab a system of **irrigation canals** has been made by officers of the British government; water is taken from the rivers at convenient places and led by irrigation channels to the cultivated lands.

Mining.—A few Indians are miners ; these Indians are not industrious ; a short spell of work in the mine will yield sufficient wages for their support, and they have not been taught by civilisation that by working harder they can earn more wages, and so have a surplus of money which will place them beyond the risk of starvation and penury. Civilisation has not yet taught these miners that it is better to live in a clean and comfortable house than in the squalid hut which is characteristic of the native village. Coal is mined in the district to the west of Calcutta near **Jherria**. This coal is sent to Calcutta by rail, and sent from Calcutta, by ship, to Madras, Bombay, Rangoon, Karachi, the other chief ports of the country. Some of the coal is distributed by the Ganges. Coal is not required for household purposes ; it is used in the factories, on the railways and on the steamships. India mines large proportions of the world's **mica** and **manganese**. Mica is used for windows in furnaces where the great heat would cause glass to melt, and is mined chiefly at **Hazanbagh**. Manganese is used in the production of certain kinds of steel, and is mined in the neighbourhood of **Nagpur**.

Railways and navigable rivers.—India is provided with an extensive system of good roads, and the rivers of the lowland are navigable for long distances (Fig. 131). But such means of travel and transport are not sufficient, and railways have been built to connect the chief towns. These railways keep to the lowland, and cross the Deccan only where a short cut will take them near an important town, *e.g.* Nagpur (Fig. 131).

Exports.—The exports of India are sent to Europe, chiefly to the United Kingdom, or to near lands across the Indian Ocean. Wheat, tea, silk, jute and indigo are sent almost entirely to Europe. Rice and cotton are sent to Europe and to Japan, and rice is also sent to the Straits Settlements. Tobacco, cotton goods and opium are only sent to neighbouring lands.

Imports.—The articles imported into India are chiefly manufactured cotton, wool and iron and steel goods from the United Kingdom.

Despite the fact that India produces one-third of the world's cane sugar, a quantity equal to a twelfth of the world's production is imported chiefly from **Java** and **Mauritius**.

Towns.—The great towns of India are numerous, since the population is so dense. **Delhi**, the capital, **Allahabad**, **Benares** and **Calcutta**, the chief port, are on the Ganges, or its chief tributary, the **Jumna**. **Nagpur**, **Hyderabad** and **Mysore** are on the Deccan. **Bombay** and **Madras** are great towns as well as ports. All these towns

combine the poverty of a native quarter with the gorgeous splendour of fine buildings in the part which is inhabited by Europeans or native princes. Each has its native bazaar or market-place, where petty trading for small quantities of many necessities goes on by



the side of sales of large quantities of articles of native manufacture, which would rival in value the purchases made in the large shops of the Western world. In a bazaar the small shopkeeper sells goods in "half-pennyworths," and the great dealer sells goods worth hundreds of pounds in open stalls almost side by side.

SUMMARY.

India is the great tropical portion of the British Empire. With Ceylon, India provides tea for Britons, the great tea-drinkers.

India provides Lancashire with raw cotton; and Indians wear a large proportion of the cotton cloths which Lancashire makes.

India grows wheat for England, and bids fair to become the "granary of the British Empire."

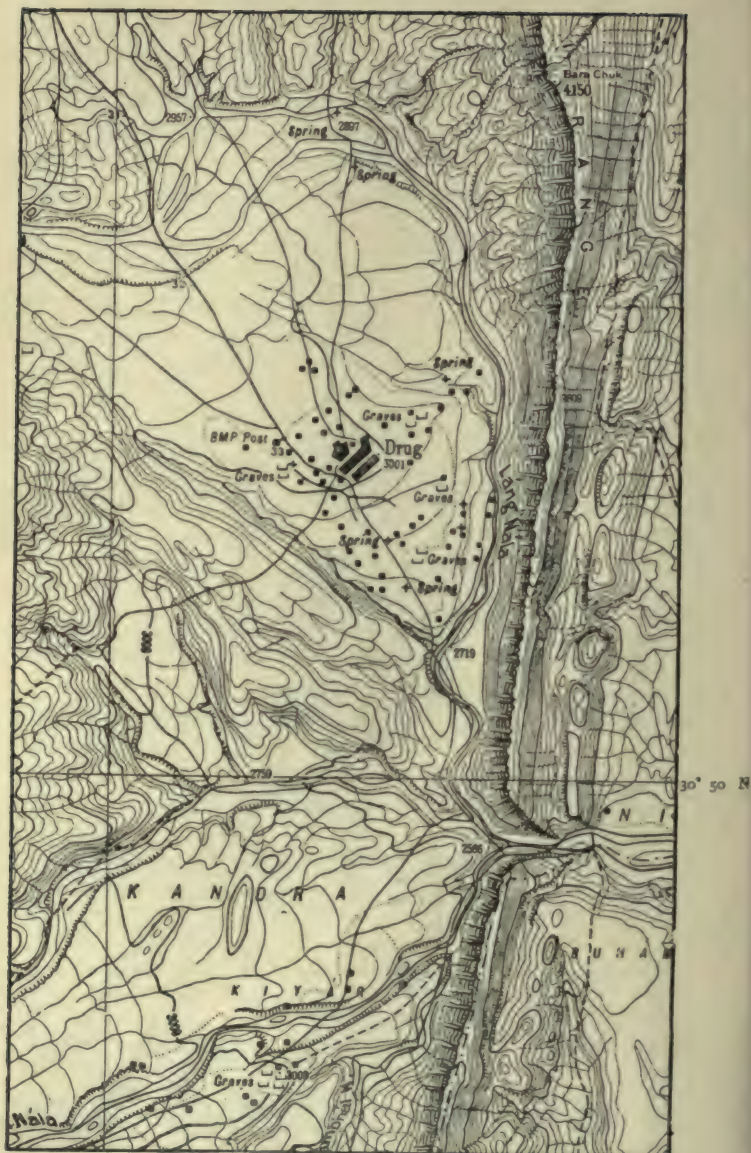
The people of India are patient, industrious and self-centred. Their progress is due to the careful administration of justice, to the laborious engineering works in making railways and irrigation canals, to the forethought which is exercised by the comparative handful of British servants of the Indian Government who represent the mother-country in the Indian Empire.



FIG. 132.—INDIA: PRODUCTS.

EXERCISES.

1. Describe the railway system of India. Add a map. (*O.U.L.)
2. Write a brief description of the Deccan, naming its boundaries and the rivers by which it is traversed. Account for its climate and productions. (*O.U.L.)
3. Show on a map two extensive regions in India, in one of which there is an exceptionally dense and in the other an exceptionally sparse population. Give reasons for the difference. (*O.U.L.)
4. In what parts of India and Ceylon are tea and coffee grown? Explain how climate and soil determine their distribution. (C.W.B.)
5. Draw a map of India and insert the Ganges, Jumna, Godaveri and Indus. Mark the areas where tea, coffee, cotton, wheat and rice are grown, together with Bombay, Allahabad, Agra, Lahore, Karachi. (*C.W.B.)



70° 10' E.

FIG. 133.—PART OF THE PANJAB.

6. Examine Fig. 133. The map is a reproduction of a plane-table survey to a scale of 1 in. = 1 mile. The district consists of the lower portions of the eastern slopes of a part of the Sulaiman Mountains near the boundary of the Panjab about 25 miles west of the Indus into which the rivers and streams drain. Describe the relief of the district, using the terms gorge, ridge, scarp, meanders, alluvial flat. The contour lines are at 100 ft. intervals; the continuous lines which radiate from Drug are camel roads, the dotted lines are mule-paths.

Examine the position of the springs; how do the springs affect the location of the villages? What is the controlling factor in the direction of the camel roads? Why are all the streams which join the Láng Nála from the East so short?

37. Japan and China.

1. Make diagrams for seasonal rainfall for the following places, and state what type of rainfall occurs in Japan and China :

Place.	Winter.	Spring.	Summer.	Autumn.
Tokio - - - -	12	25	31	32
Nagasaki - - -	13	28	40	19
Hakodate - - -	17	17	33	33
Hong Kong - - -	5	27	52	16
Yunnan - - - -	2	26	58	14

2. Write a brief note comparing the climate of Japan with that of Newfoundland: both are on the eastern sides of great continental land masses, but Japan is nearer to the equator than Newfoundland.

The Japanese islands.—The islands which comprise the empire of Japan are **Hokkaido**, **Honshiu** (mainland), **Kiushiu**, **Shihoku**, as well as part of **Sakhalien**, the **Kurile Isles**, and the island of **Formosa**, away to the south. The interior of the islands is always mountainous; there is practically no lowland of any magnitude: the largest plain is that near **Tokio** (Fig. 134). The rivers are therefore mountain torrents, which flow in rocky gorges, and after the melting of the snows flood the alluvial flats which occur near their mouths (Fig. 134).

Despite the rapidity of the current, attempts are made to utilise the rivers for navigation. Boats are regularly floated down stream laden with cargo and passengers; most of the journey is occupied with shooting the rapids. Poles are used by the crew to keep the boat off the rocks, and in many places so many poles have been pushed against the rock in the same spot that a deep hole now

marks the place. The return journey up stream is toilsome in the extreme ; the boat is pulled or towed along by men ; no animals could scramble like these men and pull steadily all the time.

People.—This instance of the labour which the Japanese endure as a habit is typical of the race. Without lowlands there are few



FIG. 134.—JAPAN RELIEF AND RAILWAYS.

Emery Walker sc.

opportunities for agriculture, and consequently any land which is tilled is cultivated with infinite patience and exquisite care. It is said that the Japanese rises at midnight, and by the light of a paper lantern brushes the insects from his growing rice plants.

The scarcity of lowland results in few pastures ; but in any case in Japan grass does not grow easily, so that Japan has few domestic

animals. Consequently, men are extensively used as beasts of burden ; they carry goods between places which are as yet not served by railways. In the towns they pull the rickshaws, which are the Japanese equivalent of a carriage.

Rice is grown in Japan as in other monsoon countries, and by exercising great care the Japanese obtain rice of excellent quality. Most of this high-class rice is sold and exported, and with the money so obtained the Japanese buy larger quantities of cheaper rice, which is chiefly imported from India.

The patience of the Japanese is strikingly illustrated by their artistic products, which are to be found in the shops of all the large cities of the world. The cloisonné vases, the little statuettes in metal and ivory, and the work in bronze, are almost all hand-work. In its detailed craftsmanship such work emphasises the fact that the Japanese is willing to work long hours for small wages ; and this circumstance is only possible to him because he can support life on small quantities of rice, and does not eat expensive meat as the European workman does. In this respect he resembles the labourer of India or China.

Japan is a storm centre. Off the Japanese coast typhoons rage over the ocean ; especially during the summer. But storms are not confined to the atmosphere ; the earth itself has storms or earthquakes. During an earthquake the surface of the earth trembles so violently that in many cases buildings rock on their foundations, and movable articles of furniture are dashed to the ground. Consequently, a Japanese house is constructed so as to endure earthquake shocks with the least possible destruction.

There are many trees in the forests which cover the slopes of the inland mountains, and therefore the houses are made of timber. They are one-storied, and they are not permanently divided into rooms. The interior is capable of subdivision into rooms by the use of screens made of a special kind of paper in wooden frames, which form what in England are called the party-walls. As occasion demands, a house may contain many small rooms or one or two large rooms.

In the cities the houses are close together, and there is great danger from fire ; whole quarters of a city may be burnt out as the result of one outbreak of fire. The firemen find great difficulty in confining the fire to one street or one small block of buildings.

Agriculture.—Most of the Japanese live on the land, in the same way as the peasants of India. They frequently occupy a small

holding, from which two crops are raised annually. Very little farm produce is exported ; besides the rice already mentioned, **raw silk** and **tea** are the chief exports of this kind. The Japanese farmer does not produce sufficient for the population, so cane sugar as well as some rice is imported. This sugar is obtained, as in the case of India (p. 231), from the Dutch East Indies.



FIG. 135.—JAPANESE FARM LAND. Photo Underwood & Underwood

(Note the telegraph poles beside the road, and the forested hill-sides.)

Mining.—Japan mines one per cent. of the world's coal, chiefly in **Kiushiu** and **Hokkaido**. Some gold, silver, lead, iron and copper are also mined, chiefly on the mountain slopes of **Honshiu** (Fig. 134).

Manufactures.—The Japanese have manufactured artistic goods for centuries ; they have long manufactured their own kinds of cotton goods for clothing, from cotton which is imported nowadays from India, China and the United States. Since labour is cheap these cotton goods are cheap, and some are exported to China. Higher-priced cotton goods are imported into Japan from England.

The Japanese have shown a great desire to learn Western methods of manufacture on a large scale, and many Japanese have worked in the factories and ironworks of England, Germany and the United States, in order to obtain sufficient knowledge to set up factories, etc., in their own country. Japan, therefore, manufactures goods of iron and steel, builds some of her own bridges and railway stock, and some of her own ships. At present she imports iron and steel goods from the United States, England, Germany and Belgium.

Communications.—Some of the rivers are used for traffic ; and roads are used up the valleys and over the mountains, while railways

have been built (Fig. 134) to connect the chief towns with the mining centres. There is also frequent communication from port to port by coasting vessels, and travel from one island to the other is necessarily confined to ships.

Towns.—The chief ports are **Yokohama** and **Kobe**: the former does two-fifths and the latter one-third of the traffic. These two ports are the termini of most of the long-distance traffic overseas to Europe, America and Australia. Local traffic to China and the East Indies starts also from **Osaka** and **Moji**, as well as other smaller ports.

Yokohama is the chief port for the capital, **Tokio**.

The Japanese Empire.—**Formosa** and **Korea** (or Chosen) are parts of Japan which she has recently obtained by conquest. Formosa is notable for its production of **camphor**, which is a forest product similar to rubber. Korea is a field for Japanese emigration; the population of the islands is so numerous that an outlet had to be found for the surplus people.

China.—Compared with Japan, China is large and scattered, while Japan is small and compact. No part of Japan is far from the sea, while the vast uplands of China are so remote from the Pacific Ocean and from the capital, **Pekin**, that the governors of the outlying provinces are often practically independent, and the peasants are usually ignorant of what happens in the distant parts of the Celestial Empire, as China is sometimes called. The Japanese tend to be supremely interested in the doings of their whole country, and within the last half-century have taken a profound interest in the outside world: the Chinese are self-centred, just as are the peasants of India, and they are so self-centred that the horizon of their thoughts and interests rarely expands far beyond their immediate locality.

Japan has never had room to expand into an extensive empire. China used to rule Asia from the Pacific right across the far western limits of the Gobi; recent explorations have shown that the Chinese empire once flourished in the valley of the upper Brahmaputra and in the lands to the north. In the time of Marco Polo, China was all-powerful in this region. Japan has advanced while China has declined.

An instance of the relative value of the two countries occurs in connection with coal. Japan mines coal for her own ships and trains: she exports the surplus and sells it at Singapore in competition with coal from Australia. China has more extensive coal-fields than Japan, but mines very little and exports none. Japan has railway transport; much Chinese coal is not mined because there

are usually no adequate means of sending the coal from the mine to the market.

Chinese agriculture.—The lowlands of China are extensive in the neighbourhood of the great rivers (Fig. 127). Consequently, China produces large quantities of silk, tea, rice and wheat.



Photo Underwood & Underwood

FIG. 136.—THE CROWDED TOWN LIFE OF CANTON, CHINA.

(The boats are used both as homes and as carriers of merchandise.)

Chinese silk is brought down the rivers to **Shanghai** and **Canton** or to **Hong Kong**. Much of it is exported to France and Italy. **Hankau**, the great river port on the Yang-tse, also does a large trade in silk.

China and India each grow about twice as much tea as Ceylon, but the export of tea from China is relatively less important

than from either of the British possessions. Ceylon exports more tea than either of the others in proportion to the quantity grown, and China exports less tea proportionately. The people consume most of the rice which is grown, but some is exported to neighbouring lands.

Communications.—In China, journeys are usually made by road or river; the roads are not made for wheeled traffic, and the traveller is usually carried in a palanquin. On the rivers the boats are mostly sailing vessels (Fig. 6). There are three railways: from Hong Kong to Canton, from Shanghai to **Nanking**, and across the lowland from Hankau to Peking. The latter railway is connected with the eastern end of the **Trans-Siberian Railway** in Manchuria. The railways have caused a few of the coal deposits to be worked by European methods.

Towns.—The towns are numerous along the Yang-tse and the Hoang-ho and along the coast. The population is dense in the lowland districts, as dense as it is in the Indo-Gangetic plain.

The Mongol abroad.—In countries which can be reached by sea from China and Japan some of the more adventurous Mongols work for a time to amass what appears to them as a fortune. In California, in British Columbia, in New Zealand, and in Australia there are Mongols, who intend to return home when they have saved a sufficient amount of their earnings. These people are noted for their patient industry, *e.g.* in the Otago river, N.Z., Chinese still search the bed of the river for grains of gold, although Europeans have long ceased to regard the small amount of gold which can be so obtained as an adequate reward for their labour. In certain towns on the Pacific coast, Chinese are household servants, launderers and market-gardeners. Many of these towns, like San Francisco, have a quarter set apart for the Chinese.

SUMMARY.

Japan has been called the "Britain of the Pacific." She is pushing forward a system of industries in cotton and steel which promises great rivalry to the manufacturers of Western Europe. She has mines of useful and precious metals as well as coal.

Japan is mountainous and forested, but the patient Japanese wrests a livelihood from the scanty patches of soil which the mountain or the forest leave available. He grows almost sufficient food-stuff for the whole nation.

The Chinese are not so energetic. The lowland plains of China are remarkable for their fertility. They consist of wind-blown deposits of dust called *loess*. From these plains China supplies tea and silk to many countries of the world.

EXERCISES.

1. Describe the climate of Japan, and show its connection with the relief of the land. (*O. U. L.)
2. Compare China with Japan as regards population, size, mineral wealth and means of communication. (*C. U. L.)
3. Name the chief seaports of (a) China, (b) Japan. [*N.B.*—Add a sketch map.] (Vict. Ed. Dept.)

38. The Rest of Asia.

1. Make a traced map from Fig. 127 to show the East Indian Islands, Siam, Malaysia. Shade the British possessions (Fig. 81). Name the chief islands, and insert Singapore, Bangkok, Hanoi. Name Banka and Billiton.
2. Write a brief note from Fig. 127 of the physical features which are common to all the East Indian Islands.
3. Examine Fig. 127. Write a brief note on the surface features of Siberia, and point out its relation to the surface features of the Great European Plain, which extends eastwards from North Germany across Russia.
4. Write a similar note to show the connection between the Gobi uplands and Asia Minor, Persia and Afghanistan.
5. Write a brief comparison between the Indus and the Tigris-Euphrates (Mesopotamia) and the Nile.
6. Make a rainfall diagram to show the percentage seasonal rainfall at the following places. To what rainfall region do these places belong? The total annual rainfall at Bagdad is 9 inches, that at Damascus 14 inches, and that at Smyrna 25 inches.

Place.	Winter.	Spring.	Summer.	Autumn.
Bagdad - -	55	33	—	12
Damascus - -	56	22	—	22
Smyrna - -	48	24	—	28

Equatorial Asia.—The island of Ceylon, the East Indian Islands, Malaysia, are all equatorial lands. They have constant tropical rains, which amount annually to about 80 inches ; they have a temperature which is usually not more than 5° above or below 80° F. all the year round.

The coast lands are low and swampy, and the interior is usually elevated and densely forested.

Products.—The people are on the whole plantation workers. **Tea** is a chief product in Ceylon, but **rubber** plantations are being extended in Ceylon and Malaysia. **Rice** is grown everywhere on the lowlands.

Characteristic products are obtained from the **coco-nut palm**. The fibre from the husk of the nut, called **coir**, and the dried kernel, called **copra**, are important articles of trade. Coir and copra are produced throughout these lands as well as in the Pacific Islands, and the produce is collected at Singapore and Colombo for export to Western Europe, where the fibre is used for matting, and where the oil and fat are pressed from copra and used for lubricating and other purposes.

The East Indies have long been noted for their **spices** ; in fact, the original settlements of Europeans in these islands were made in connection with the trade in **pepper** and spices. Singapore collects pepper and spices, as well as tapioca, from the islands to send to Western Europe.

Malaysia and the islands of Banca and Billiton contain deposits of **tin** which are worked, and from which the ore is sent to Singapore for export.

Siam.—Siam consists of the basin of the river **Menam**, and a small portion of the basin of the **Mekong** (Fig. 127). The lowlands of these rivers are not so densely peopled as those of the Ganges or the Yang-tse. The people are Mongols, and are self-centred agriculturists. The chief product is rice, and surplus rice is exported. The chief city is Bangkok.

French Cochin China.—The French colony of Cochin China consists of the mountainous ridge of Annam, with the coastal lowland on the east and the greater portion of the lower valley of the Mekong on the west. The population on the lowland near the chief city Hanoi is dense, like that of the lower Canton river. The people are Mongol agriculturists.

North-western Asia.—The mountainous region of Central Asia is continued westwards by the upland region of **Afghanistan**, **Persia**

and **Asia Minor**. Across the narrow lowland of Mesopotamia, **Arabia** is also upland.

The northern slopes of these uplands are the lowlands which form the greater portion of Siberia or Russia in Asia, and are continuous with the Great European Plain. Across this lowland the **Ural** upland stretches north and south from the Arctic towards the Caspian.

This district is notable for its basins of internal drainage. The largest of these is that of the **Caspian Sea**. This basin includes the valleys of the **Volga** and the **Ural**, and therefore includes about one-third of Russia in Europe. The basin of the **Sea of Aral** includes the steppe lands of Siberia east of the Caspian. In **Palestine** there is the smaller basin of the Dead Sea, which includes the valley of the **Jordan**.

The forested Siberian plains are traversed by the Arctic rivers, such as the **Ob**.

Climate.—The whole of this region is arid. It is not visited by the rain-bearing winds from the ocean. The north shores of Siberia are the coldest land districts in the world. South-west Siberia, in the Aral and Caspian depressions, is very hot in summer and cold in winter, with little rain. Persia and Afghanistan are sunny, hot and dry. Arabia is the Asiatic equivalent of the Sahara. Asia Minor is hot in summer, and wet and cool in winter; the plateau is so elevated that there is a great difference between the upland temperatures and those of the coast. The Caucasus and Elburz mountain ranges are snow-covered.

Vegetation.—The north is forested; and forests are found on the mountain ranges of the Caucasus and the Elburz. The Siberian plains are steppes, or natural grass lands. Persia and Afghanistan are so arid that natural vegetation is lacking.

People.—The people as a rule are self-centred: only on the steppes are **wheat**, **butter** and **eggs** produced for export to Western Europe.

The true steppe dweller is a nomad, whose whole life is bound up with the increase of his flocks. The cereals are grown by emigrants. Sheep are numerous on the southern uplands, particularly in **Persia**, so that the export of wool and the production of **carpets** occupy some of the people. Asia Minor is inhabited by a Mediterranean people, who produce, for example, surplus **figs**, which are exported from **Smyrna**.

Trans-continental railways.—Communication between the

Atlantic Ocean and the Pacific or Indian Ocean was in former times entirely by ship round the Cape of Good Hope ; about fifty years ago the Suez Canal enabled ships to go more quickly to the East from Europe. More recent developments have been by railway. From St. Petersburg a railway has been completed across Russia and Siberia ; the terminal ports are **Vladivostok** in Siberia and **Port Arthur** in Japanese territory. This railway makes it possible to get from London to Tokio in less than three weeks, but it has had no effect on communication between Europe and India. Therefore, a railway is planned from Constantinople to Bagdad, with the hope that it may be extended to connect with the railway system of India and also with the railway system of Russia in the Aral depression. One great use of the Bagdad railway will arise in connection with the journeys of thousands of Mohammedan pilgrims annually to Mecca. This traffic already passes over part of the system which has been built from Aleppo to Medina.

SUMMARY.

Equatorial Asia is comprised chiefly of islands ; these islands are in the belt of tropical forest and their inhabitants produce tea, rice, spices, and coconuts. North-western Asia includes the arid plateaus of Arabia, Persia, etc., the arid lowlands near the Caspian Sea and the steppe lowland of Siberia. Most of the native people are nomads, but settlers farm on the Steppes as on the Canadian prairie. This steppe is crossed from west to east by the Trans-Siberian Railway.

EXERCISES.

1. Describe Ceylon. What are the chief occupations of the inhabitants ? Why is the south-west so populous ? (*O. U. L.)
2. What are the conditions favourable to the production of tea ? Describe the surface and climate of Ceylon, and hence explain its large tea industry. What portion of India is similar ? (*O. U. L.)
3. State (i) why Bombay derived greater advantage from the making of the Suez Canal than Calcutta ; and (ii) from what parts of Asia large supplies of cotton, silk, rice, tobacco and tin are exported to Western Europe and the United States. (*C. U. L.)
4. Give the exact situation of each of the following, and explain how the situation and climate of each aid or obstruct its progress : Singapore, Calcutta, Damascus, Hong Kong, Smyrna, Rangoon. (C. P.)

5. Contrast Hindustan with Siberia with respect to climate and vegetable productions. (C.P.)

6. State precisely the regions of the world where cane sugar or tea is produced. What are the conditions required for its production? (N.U.)

TEST PAPER.

1. In Australia, as in India, vegetable production varies as the amount of water available, either from rivers, wells or rain. Illustrate this for both countries, and at the same time point out why the rainfall is much heavier in some districts of each country than in others. (*C.P.)

(N.B.—Tabulate the first part of the answer in three columns: (i) water supply; (ii) Australian regions and products; (iii) Indian regions and crops. In column (i) discuss in order: (a) deserts; (b) rainfall about 20 inches annually; (c) heavy rainfall; (d) rainfall chiefly in summer; (e) rainfall chiefly in winter; (f) irrigated districts.)

2. Illustrate from (a) the south-east corner of the United States, (b) Burma, and (c) Natal, the relation of climate and vegetation. (C.P.)

(N.B.—Tabulate in three columns: (i) district; (ii) climate; (iii) vegetation.)

3. Show, on a sketch map of Asia, the general distribution of the high-lands and the dry regions, marking the latter by intersecting straight lines. Mark the districts where *tin* is found by the letter *T*, where *coal* is found by the letter *C*, and the *monsoon* region by vertical lines. (C.P.)

4. Describe the distribution of population and the life of the peoples of Ceylon, Labrador and the South Island of New Zealand. Point out how geographical conditions, including climatic, affect these in each case.

(Sc. Ed. Dept.)

Give a description of everyday life in *any one* of the following regions: Japan, the Canadian prairie, the grass lands of Australia, the African deserts. Touch on such topics as food, clothing, homes, occupations, recreations, means of transport. (Sc. Ed. Dept.)





SECTION V. EUROPE

39. Europe.

1. Examine Fig. 137. Write a brief note describing that part of the Eurasian lowland which is European. Refer to the decrease in width from north to south ; contrast the rivers of Russia with those of Germany in so far as these rivers cross the lowland.

2. Examine Figs. 127 and 137. Write a note pointing out the connection which exists between the mountains of Europe and the mountains of Asia.

3. Make a sketch map of the shore lands of the Western Mediterranean, west of long. 20° E. Shade the land higher than 3000 feet. Name the Pyrenees, the Alps, the Apennines, the Atlas mountains. Insert and name Sicily, Corsica, Sardinia and Malta.

4. Write a brief note contrasting Italy with New Zealand in latitude, longitude and relief.

Size.—Europe is the smallest of the continents : it is about the same size as Canada, the United States, or Australia. On the whole, Europe contains the smallest proportion of waste lands : there are no hot deserts, and the tundra or cold desert does not reach so far south in Europe as in Canada. Proportionately, also, Europe contains a larger share of lowland than any other continent.

Russia is equal in size to about half of Europe : it is more than ten times as large as **Germany**. The **British Isles** occupy about one-thirtieth part of the continent.

Position.—**Britain, France, Belgium, Holland and Germany** are all close to the centre of the land hemisphere of the globe (Fig. 81). All these countries surround the **North Sea**, and have open sea communications with the Atlantic Ocean, and therefore their ships find ready access to every port in the world.

Relief.—Europe is but an Asiatic peninsula. The central highland of Asia is continued westwards in the mountains of Southern

Europe. The line of highlands passes from the **Caucasus** to the **Balkans**, from the **Balkans** to the **Alps**, bends south to form the **Apennines**, and is continued across the Mediterranean to the **Atlas Mountains** of North Africa. The **Carpathians** encircle the lowland



FIG. 138.—AN ALPINE GLACIER.

plain of the lower **Danube** which forms **Hungary**. **Spain** is an upland plateau, with a mountainous edge in the **Pyrenees**, which resembles on a much smaller scale the greatness of the Himalayan edge of the Tibetan plateau.

The plains of North Asia are continued in the great European plain which reaches the Baltic and North Seas, crosses the latter to form south-east England, and finally faces the Atlantic winds from the Bay of Biscay. The uplands of **Norway** are connected with the uplands of **Scotland**, and these uplands are the most important part of Europe which is not a westerly continuation of a similar physical feature in Asia.

Western Europe and Eastern Asia.—The Eurasian coasts between lat. 40° and 60° N. are in striking contrast. In Europe, on the west, the shore lands consist of Denmark, Germany, Holland, Belgium and France, with part of the shores of Spain. These lands

are low: the whole coast from the Pyrenees to Norway is marked by low sandy hills, with but gentle undulations.

In Asia, on the east, the shores stretch from the elevated peninsula of **Korea** northwards, and the uplands are quite close to the coast; in this region the central highlands reach the Pacific Ocean.

The British islands on the west consist largely of lowland; Sakhalien and Hokkaido on the east are chiefly upland, with little lowland.



[Photo B. C. Waino.]

FIG. 139.—A BRIDGE OVER THE SEINE AT PARIS.

On the east the **Loire**, **Seine**, **Rhine** and **Elbe** flow down from the southern highlands of Europe, and for a large portion of their course they cross the European plain. In Asia, only the **Amur**, which is a longer river, enters the Pacific, after a lower course through a trench-like depression.

In climate the contrast is equally striking. Western Europe is wonderfully warm in winter (Chap. 11).

The North Sea rarely has any shore ice, even in very cold winters; winter navigation is almost as easy as summer sailing. On the east, the coast is frost-bound during the winter. **Vladivostok**, the only port of note, is closed by ice for many months.

Consequently, the European shores are the homes of many millions of people, while probably only a few thousands of people make their homes on the Pacific coasts. Belgium and parts of England such as **South Lancashire**, have the densest populations in the world, and

London, Berlin, Paris, Hamburg, four of the world's largest cities, lie on the lowland.

This difference between east and west is also illustrated in the case of North America by the difference between Labrador and British Columbia.

Climate.—The climate of Europe may be said to have three distinct regions, which merge into one another on their borders.



FIG. 140.—EUROPE: SUNSHINE IN HOURS PER ANNUM.

Foremost comes the climate of Western Europe, with its special warmth in winter, its small range of temperature, and its variable rainfall (Chap. 11).

Secondly, there is the climate of the Mediterranean lands, with the wet cool winters, and the hot dry summers (Chap. 9).

Finally, the inland continental climate of the Russian plain. Russia resembles the interior of Canada: there is a scanty rainfall, great summer heat, and intense winter cold.

All these climates depend on the winds from the Atlantic Ocean

(Figs. 59 and 60). The western region owes its equable temperature and its winter warmth to the fact that the **westerlies** continuously bring stores of warmth from the warmer portions of the Atlantic Ocean. The Mediterranean regions owe their winter rainfall to the fact that the westerlies penetrate into the Mediterranean area only in the autumn and winter months. Consequently, the rainfall begins early in the south of France, and later in the year reaches first **Italy** and then **Greece**, and only reaches the **Levant** spasmodically during the winter. The Russian plain is so removed from the Atlantic Ocean that those westerly winds which blow over the plain are dry, because they have left their rainfall on the shores of the North Sea.

Winds leave the rain they bring more easily upon the mountains than upon the plains (p. 84). The rainfall map of Europe, therefore, resembles the orographical map: the higher lands are the wet lands, the lowlands are dry.

Mediterranean Europe is most sunny; on the average there is from 6 to 7 hours sunshine daily. Western Europe is less sunny since the westerly winds drive clouds across the sky. The steppes receive about 5 hours of sunshine daily (Fig. 140).

Rivers.—The rivers of Europe are of two kinds—rivers of the lowland, and rivers which have their sources on the southern mountains, or on the uplands.

The lowland rivers are the **Dwina**, which flows into the Arctic at **Archangel**; the **Volga**, which belongs to the Caspian depression; the **Don** and the **Dnieper**, which flow into the Black Sea, which would be a basin of internal drainage but for the narrow strait which separates Turkey from Asia Minor near **Constantinople**. These rivers are navigable throughout most of their courses.

The rivers of the mountains on the north and west are the **Vistula**, the **Oder**, which flow into the Baltic Sea; the **Elbe** and **Rhine**, which flow into the North Sea; the **Seine** and **Loire** and the **Douro** and the **Tagus**. These rivers have long courses over the lowland, and are navigable for long distances inland.

The rivers of the mountains on the south are the **Rhone**, **Ebro** and **Po**, which flow into the Mediterranean, and the **Danube**, which flows into the Black Sea. The latter is navigable for so long a distance that only a short journey is required from a ship on the Danube to reach a ship on the Rhine or on the **Main** (Fig. 141).

Divisions of Europe.—Corresponding to the three great climate

regions, and roughly corresponding to the three great groups of rivers, it is possible to think of Europe as composed of three great divisions.

First, the north and east includes Norway, Sweden, Poland, Russia, Czecho-Slovakia, Austria and Hungary, Bohemia, the Danube states and Turkey. For the sake of its relation to Sweden, Norway is included, and for the sake of their relationship to the Danube and the Black Sea, Turkey, etc., are also included in this division.



FIG. 141.—EUROPEAN WATERWAYS.

- | | | | |
|---------------|--------------|-------------|----------------|
| 1. Barcelona. | 6. Almeria. | 11. Turin. | 16. Pisa. |
| 2. Ceuta. | 7. Valencia. | 12. Milan. | 17. Leghorn. |
| 3. Bilbao. | 8. Murcia. | 13. Lyons. | 18. Corinth. |
| 4. Oporto. | 9. Seville. | 14. Basle. | 19. Göschinen. |
| 5. Malaga. | 10. Mantua. | 15. Geneva. | 20. Airolo. |

Secondly, there are the *Mediterranean countries*, Greece, Italy, Spain ; and Portugal is included with Spain.

Thirdly, there are the states of *Western Europe*, which have coast-lines which are washed by the North Sea.

This division by countries is not entirely satisfactory, because the south of France should be included with Italy as a Mediterranean

country ; but on the whole France resembles Belgium and England more than it resembles Italy.

SUMMARY.

Europe is an Asiatic peninsula. The Alps and other mountains are a continuation of the Asiatic mountains westward ; the European plain is a continuation of the North Asiatic lowland. Europe contains three climatic regions ; (i) Western Europe with warm winters ; (ii) Mediterranean Europe with winter rains ; (iii) lowland Europe with a continental climate.

EXERCISES.

1. How does the *west* of Europe differ from the *east* with respect to rainfall and winter and summer temperatures ? Explain why these differences exist. (C.P.)
2. What differences of rainfall are to be noted in (a) Russia, (b) West Europe, (c) Mediterranean lands ? How do you account for these differences ? (C.P.)
3. Describe the climate and vegetation of (a) Northern Norway, (b) Southern France, (c) South-eastern Russia. How far does the kind of climate explain the kind of vegetation of these regions ? How do you explain the differences in climate between these regions ? (C.P.)

40. Northern Europe.*

1. Draw a sketch map of the Baltic Sea. Name the countries which border this sea. Insert and name Stockholm, Malmo, Petrograd, Helsingfors, Reval, Riga, Memel, Danzig, Stettin, Kiel, Copenhagen.

2. Examine Fig. 137. Write a brief note explaining the differences in relief and climate between Norway and Sweden. How do these differences help to explain the following table of production ?

	Million bushels.			Millions.	
	Wheat.	Oats.	Rye.	Horses.	Cattle.
Norway	—	8	1	0.2	1.0
Sweden	6	77	22	0.6	2.6

3. Examine Fig. 137. Write a short note pointing out the contrast in relief between Austria and Hungary. Which of these countries is almost entirely composed of mountain valleys ? How does the difference you notice explain the table below :

* Statistics refer to pre-war conditions.

	PRODUCTION.					
	Million bushels.				Millions.	
	Wheat.	Oats.	Rye.	Maize.	Cattle.	Sheep.
Austria - -	60	150	85	16	9	3
Hungary - -	163	81	44	170	7	8

Hungary exports to Austria on the average annually, in million bushels :

Wheat.	Oats.	Rye.
19	13	9

Austria is slightly smaller than Hungary, and contains four people to every three people in Hungary.

4. Compare the following tables. Write a brief note of the facts you notice. Russia equals half Canada in area, and contains about seventeen times as many people :

	PRODUCTION.								
	Million bushels.					Millions.			
	Wheat.	Oats.	Barley.	Rye.	Maize.	Horses.	Cattle.	Sheep.	Pigs.
Russia	400	740	280	660	50	20	31	39	10
Canada	116	259	47	3	24	2	7	3	3

From	EXPORTS IN MILLION BUSHELS.			
	To all the world.		To the United Kingdom.	
	Wheat.	Oats.	Wheat.	Oats.
Russia - -	90	50	19	16
Canada - -	42	5	38	4

Russia.—From north to south Russia contains many belts of country (Fig. 141). Along the shores of the Arctic lies the tundra : between the tundra and lat. 60° N. lies the forest belt. South of the forest occurs the belt of mixed woodland and grass land, which

changes into the *black earth* and then into the steppes in succession. The shores of the Black Sea, especially in the **Crimean** peninsula, are very hot and fertile : they are sheltered from the cold winds of the steppes, and have a background of upland which is warmed by sunshine, so that grapes and tobacco may be cultivated.

Lumberers.—Timber, and the bye-products—wood, tar and turpentine—form one-tenth of the exports of Russia. Many people are therefore occupied in the forest belt in cutting down the trees which are coniferous in the north and deciduous in the warmer districts. In **Finland** and its neighbourhood there are many lakes, connected by rivers. The logs are sent down the rivers into the lakes, gathered into rafts and then towed by tiny panting steamers across the lakes on their journey to the sawmills and the steamship. Elsewhere the rivers are almost entirely used to transport the logs.

Farmers.—The total export of cereals from Russia amounts to two-fifths of the total Russian exports. The vast majority of the people are therefore *farmers*. In many cases the land is farmed by peasants who are self-centred, and grow crops merely to feed themselves and their families : but in other cases the farmer produces crops on a large scale, so that, for example, one-eighth part of the world's wheat is grown in Russia. The wheat farms are chiefly on the *black earth* district, but oats and rye are grown in the colder districts to the north, and maize is grown in the warm lands to the south.

The self-centred farmer works a small patch of land with very primitive implements : it is said that a plough similar to that used by the English farmer in the fourteenth century is still in use ; but the prairie farmer has been compelled to adopt better implements, and use similar ploughs and threshing machines to those in use in America. The table on p. 254 shows that the Russian farmer is a greater producer of cereals on the whole than the Canadian farmer, and that he provides other countries with more than twice as much grain as is exported from Canada. A very large proportion of the cereals exported from Russia are sent from **Odessa**, on the Black Sea. This grain is transmitted by ship chiefly to Britain, Germany and Holland : some grain is sent via **Riga** to other countries which have ports also on the Baltic Sea. The farm animals of Russia are chiefly dairy animals, as the chief export is butter. Cattle and horses are extensively reared on the eastern steppes north of the Caspian Sea.

Miners.—Russia mines about as much coal as Belgium, and about twice as much coal as either Canada or India. This coal is chiefly used on the Russian railways and by ships which sail from Russian ports. There are two mining districts—the larger one in the **Donetz** valley, north of Rostov and the smaller one in **Poland**. Some iron is also mined.



FIG. 142.—OIL-WELL AT BAKU.

The petroleum industry almost comes under the head of mining. Near **Baku**, on the Caspian, petroleum is obtained by boring the upper rocks of the earth's crust. If the boring is successful, millions of gallons of oil gush out as from a spring. The whole district round Baku is oily beyond description. Since Baku is not a sea-port, the oil is sent to **Batum** on the Black Sea, by means of pipes.

Gold, platinum and copper are mined in the Ural uplands: the chief centre is **Ekaterinburg**.

Factories, etc.—Russia imports raw cotton to be made into cotton apparel in her own factories at **Lodz**, in Poland, and near Moscow.

Iron is made into iron and steel goods at **Tula** and **Zlatoust**, but iron and steel goods and machinery, as well as woollen goods, are imported, largely from Britain.

Communications.—Besides the many navigable rivers (Fig. 141) there is an extensive railway system which connects the chief towns, such as Odessa, Riga and Moscow, with the capital, Petrograd.

South-east Europe.—**Turkey, Bulgaria, Yugo-Slavia, and Rumania** are west of the Black Sea. The climate is similar to that of South Russia, and cold winds blow from Russia in winter, so that Constantinople is exceptionally cold during this season.

Rumania is a continuation of the Russian farm lands, and has extensive farms, especially for wheat and maize. Bulgaria and Yugo-Slavia are more elevated than Rumania, and contain the chief portions of the Balkan mountains.

Consequently, these lands do not produce such quantities of cereals ; but throughout this district the peasant is self-centred and grows his own food.

Two great lines of communication cross this area. The *waterway* of the lower Danube is an international highway, and much traffic passes by this route from the Black Sea to Central Europe. The *railway* from Western Europe to Constantinople crosses Yugo-Slavia and passes through its capital, **Belgrade**. The route connects by a short sea journey across the Bosphorus with the Bagdad railway.

Yugo-Slavia stretches east from the Adriatic Sea and south from the river Drave, and contains a sturdy peasant population much attached to the soil ; the country is ready for great progress under the new peace conditions. Plums and pigs are factors in its prosperity. It now includes some of the best wheat land of the Alföld or Hungarian Plain.

Bulgaria lies between Yugo-Slavia and the Black Sea, south of the Danube. Its capital, Sofia, is on the great route to Constantinople. The people are great market-gardeners and should flourish if peace is maintained.

Austria-Hungary.—The two Republics of Austria and Hungary present many sharp contrasts. In relief, Austria consists of mountain valleys, while Hungary is composed of the plains of the middle Danube, ringed round by the Carpathians. Austria includes the Alpine valleys of the **Tyrol** ; and the Alpine portions of the valleys of the **Save** and **Drave**. Being more elevated, Austria is colder and rainier than Hungary.

The farmers of the two countries differ in their productions. Austria grows more oats and rye, while Hungary grows more wheat and maize. The Austrian farmers do not grow sufficient cereals for the food of the people ; Hungarian farmers supply wheat, oats and rye to make up the deficiency.

Sugar and timber are the chief exports ; and coal, raw cotton, raw wool and machinery are the chief imports.

Consequently, Hungary and Austria are complementary.

Vienna and **Buda-Pest**, the two capitals, are the two greatest cities on the Danube and two of the chief cities of Europe. Vienna

is situated on the cross-roads, where the Danube route is crossed by the route from the Baltic to the Adriatic, through the Moravian gate, between the Bohemian plateau and the Carpathians (Fig. 143). Consequently, Vienna is the greatest city of inland Europe.



FIG. 143.—THE SITUATION OF VIENNA.

(Note the railway lines, from Linz to the west, Pilsen to the north-west, from the Elbe Valley via Brunn, through the Moravian Gate from Breslau, Warsaw, and Cracow, from Trieste by the Semmering Pass, and from Buda-Pest along the Danube Valley.)

Scandinavia.—The **Scandinavian peninsula** includes the two monarchies of **Norway** and **Sweden**, which also present striking contrasts. **Norway** is upland and snow-covered in great part perpetually. **Sweden** is lowland, and free from snow in the summer. The Norwegian shore is washed by the warm water of the Atlantic, and is swept by warm westerly winds. The Swedish shore faces the Baltic, which is largely ice-covered in winter.

Some cattle are pastured in Norway, but otherwise the Norwegian is not a farmer; some Swedes till the land and produce oats and rye, crops suited to their cold climate.

Many Norwegians are fishers; the Atlantic Ocean off their shores is shallow—*i.e.* less than 600 feet deep—and many cod are caught near the **Lofoden Islands**, and herring are caught further south near

Bergen. On the other hand, many Swedes are lumberers. The forests of Sweden are like the forests of North Russia, and many lakes and rivers are utilised to transport the logs.

Some Swedes also are miners. Some of the purest deposits of iron ore occur in South Sweden, near **Dannemora**. Much of the iron which is obtained finds its way to Britain, especially to the Sheffield district

EXERCISE.

1. Describe and locate the typical *steppes* of the world. (*C.P.)

41. Mediterranean Europe.

1. Draw a sketch map of the Mediterranean Sea. Name the countries, and insert and name: Madrid, Lisbon, Gibraltar, Barcelona, Marseilles, Genoa, Milan, Rome, Naples, Venice, Corinth, Athens, Constantinople, Smyrna, Jerusalem, Alexandria, Cairo, Tunis, Algiers.

Name the islands.

2. Write a brief note to show the contrast between the Iberian and the Italian peninsulas in shape, relief and climate. Point out the effect that nearness to the Atlantic Ocean has upon the climate of Portugal.

3. Examine Figs. 127 and 137. Write a brief note contrasting the central mountains of Europe, the Alps, with the central mountains of Asia. Draw attention to differences in height, in area, and compare the wall of the Alps, overlooking the lowland of the Po, with the wall of the Himalayas, overlooking the lowland of the Ganges.

Mediterranean Europe.—This division of Europe is held to include the countries which are strictly Mediterranean, *i.e.* **Spain**, **Italy** and **Greece**, as well as **Portugal** and **Switzerland**. Italy is a little larger than New Zealand, and as much less than the United Kingdom. Greece is about one-fifth of the United Kingdom, and Portugal about one-third of Italy. Spain is as large as Italy, Greece and Portugal together.

The **Iberian Peninsula** contains both **Spain** and **Portugal**: it is an elevated plateau like Asia Minor, with a narrow coastal strip of lowland. The **Tagus**, **Douro**, **Guadiana** and **Guadalquivir** flow westwards, and have fairly wide lowland valleys near their mouths. All of these lowlands, but the last, are in Portugal. The **Ebro** is the chief river flowing eastwards to the Mediterranean.

The plateau has a fringe of mountains on its northern border; these mountains drop rapidly to the coast, and continue their downward slopes so steeply that the southern portions of the Bay of Biscay are very deep waters. These mountains are the **Cantabrian Mountains** on the west and the **Pyrenees** on the east. The Pyrenees form a natural barrier between France and Spain. On the Spanish side the valleys which lead into the mountains end in a wall of rock of almost semi-circular shape, with a steep impassable face. On the French side the valleys occasionally lead to narrow, tortuous and difficult passes into Spain. Only at the ends, near **Perpignan** and **Biarritz**, is it feasible to make a railway line from France to Spain. Biarritz is almost on a straight line drawn through **Paris** and **Madrid**, and the chief railway consequently goes through this town. The middle of the plateau near Madrid rises into ridges such as the **Sierra de Guadarrama**. The valley of the Guadalquivir lies between the **Sierra Morena** on the north and the **Sierra Nevada** on the south. The latter were made by earth folding about the same time as the Atlas Mountains across the Straits of Gibraltar.

Climate of Spain.—In consequence of its elevation Spain is drier, less cloudy, and therefore hotter in summer than Portugal, which is watered by rainfall from the westerly winds, especially in the cooler parts of the year. Portugal is forested on the slopes, and Spain is arid. In Spain the peasant is poor, because the soil is lacking in fertility and the climate arid. Only south-east of Madrid is the land productive; and this fact is due to extensive irrigation works, which make the gardens of **Murcia** and **Valencia** yield good returns of Mediterranean fruits.

The **Guadalquivir** supplies water for the gardens of **Seville** and **Cordova**.

Towns.—Except **Madrid**, the chief towns of the peninsula are near the coast or on it, where the rivers join the sea. **Barcelona**, **Cartagena**, **Valencia**, **Malaga**, **Cadiz**, **Lisbon** and **Oporto** are such towns, and from the ports oranges, olives, wines and dried grapes are exported.

Bilbao on the Bay of Biscay is an iron port, for Spain vies with Sweden in supplying pure iron ore to be smelted in the Sheffield steel district.

Italy.—The Italian peninsula consists of two regions. First, the northern lowland, the valley of the **Po**, which resembles on a smaller scale the lowland of the Ganges, except that the western end is ringed with a continuation of the mountains. Secondly, the true

peninsula has a ridge of upland with coastal lowlands on each side. The water-parting of this ridge is on the whole nearer to the **Adriatic** shore, so that the rivers of the peninsula, such as the **Arno** and the **Tiber**, flow westwards. The peninsula forms the heel and toe of Italy in the south, and off the toe lies the Italian island of **Sicily**. West of Italy are the two islands of **Corsica**, which is French, and **Sardinia**, which is Italian. All three islands have mountainous interiors.

Many tributaries flow into the **Po**, both from the Alps on the north and from the Apennines on the south. The Alpine rivers on the west issue from long narrow Alpine lakes, such as **Como** or **Maggiore**. From the lowland the valleys lead upwards to the Alpine passes; the **Mont Cenis**, **Great St. Bernard** lead into France on the west, the **Simplon** and **Mont St. Gothard** lead to Switzerland on the north. From the mouth of the river near **Venice** the lowland stretches north-eastwards to a comparatively low ridge, which is crossed by the routes which lead into Austria and Hungary.

This lowland, the plain of **Lombardy**, is fertile and well watered, and contains therefore a large proportion of the Italian population, which totals about twenty million people, as well as many famous towns, such as **Turin**, **Milan**, **Mantua**, and the great port of the Middle Ages, **Venice**.

Because the river valleys are larger and longer on the west of the peninsula than on the east, the chief towns are on the west. The settlement of these towns was considerably helped by the fact that the east coast faced the narrow Adriatic, while the west coast faced the wider Mediterranean. **Genoa**, **Florence**, **Pisa**, **Leghorn**, **Rome** and **Naples** are the chief places of the peninsula, and they are all on the west.

Greece.—Greece is a mountainous mass, from which many peninsulas radiate into the sea. The Gulf of **Corinth** cuts into the land so far that only a narrow isthmus separates the Gulf from the arm of the sea on which **Athens** is situated. Corinth and Athens are the chief towns.

Switzerland.—Switzerland contains mountains clad with perpetual snow; upland pastures, called **alps**, grassy and flower-decked in summer, snow-clad in winter; and deep valleys with torrential rivers which flow into large lakes, such as Lake **Constance** or the Lake of **Geneva**.

Because of the variety of scenery, the variety of climate and the joys of mountaineering, Switzerland is the *play-ground of Europe*, and is visited annually by thousands of people.

Because of the snow and the heavy rainfall, Switzerland is the country of origin of many of the largest rivers in Europe. The tributaries of the Po and of the Danube, as well as the main streams have already been mentioned. In addition to these there are the **Rhine** and the **Rhone**. The St. Gothard tunnel, from Goeschinen to Airolo, runs under the water parting between the sources of these rivers. The head-waters of the **Rhine** at first flow eastwards, then northwards to Lake Constance, then the outflow from the lake



Photo Underwood & Underwood

FIG. 144.—A SWISS ALP OR MOUNTAIN PASTURE.

passes westwards to **Basle**, tumbling over the Falls of **Schaffhausen en route**. From just below Basle the river is German. The head-waters of the **Rhone** flow steadily westwards, and then bend sharply into the Lake of Geneva. The outflow from the lake passes the town of Geneva, and almost immediately enters France.

The abundance of water makes the Swiss great users of electricity, so that water is sometimes fancifully called *white coal*. The water drives water-wheels, which turn dynamos, from which the electric current is obtained. Consequently, the Swiss have many manufacturing industries. Condensed milk, chocolate, cotton and silk goods are made, as well as clocks and watches.

Farmers.—Wheat is, by origin, a Mediterranean plant, for the

winter rains and summer drought suit the plant. Consequently, wheat is grown on the farms in Italy and Spain. Italy grows as much wheat and about half the maize of Hungary (p. 254). Spain grows less wheat, much less maize, but more barley than Italy. Portugal, Greece and Switzerland do not grow cereals at all well.

The chief domestic animals of the Mediterranean are sheep and goats.

The summer droughts prevent the growth of much pasture except on the lowlands and on the summer pastures of the Alps: consequently, cattle are comparatively scarce except in Italy and Switzerland. Milk is frequently obtained from the numerous goats;



Photo G. T. Parratt

FIG. 145.—THE ST. BERNARD HOSPICE AMID THE ALPINE SNOWS.

only in Switzerland and Italy is there a surplus of cow's milk. In Switzerland the surplus milk is made partly into cheese, but mostly into condensed milk, which is exported in tins. In Italy, in the Po valley, most of the surplus milk is made into cheese.

Communications.—The Alps are crossed by many roads which traverse the low passes between the more elevated peaks. Some of the passes reach the snow-line, but others are lower. One of the most famous of the passes is that of the great St. Bernard, where stands the famous hospice.

Imports.—All these countries import coal, and Portugal and Greece import cereals. The Catholic countries—Portugal, Spain and Italy—import codfish for food on fast days from the fishing grounds off Newfoundland and Norway. All import manufactured



goods in cotton, wool and iron to supplement the small local manufactures. Italy imports silk, which helps the local production of silk to supply the raw material for the manufacture of silk goods, which form a large export.

Exports.—Wine, fruits, oranges, olives and olive oil are typical exports. Lemons are chiefly exported from Sicily, and currants are supplied to the world from Greece.

EXERCISES.

1. Compare, and contrast, Italy and Scandinavia in (a) site, (b) structure, (c) climate, (d) vegetable productions. (C.P.)

2. Compare generally the various climates you would expect to find in the following districts: North Russia, the shores of the Mediterranean, West Norway and Central Spain. Give reasons for the variety. (C.P.)

3. What are the chief vegetable productions of Eastern Spain, Greece and Egypt? Point out how the climate and physical features of each country modify the character of these productions. (C.P.)

4. Where, in the Mediterranean area, are the following produced: sulphur, oranges, silk, marble? How do the geographical conditions of the district help the production? (C.P.)

42. Western Europe.*

1. Make diagrams to illustrate the table below.

COUNTRY.	CONSUMPTION OF WHEAT AND RYE IN WESTERN EUROPE (PERCENTAGES).			
	Wheat.		Rye.	
	Home grown.	Imported.	Home grown.	Imported.
United Kingdom - - -	6	23	$\frac{1}{2}$	$\frac{1}{2}$
Germany - - -	15	9	73	$3\frac{1}{2}$
France - - -	36	1	10	—
Belgium - - -	$1\frac{1}{2}$	5	4	—
Holland - - -	$\frac{1}{2}$	2	3	1
Denmark - - -	$\frac{1}{2}$	$\frac{1}{2}$	$3\frac{1}{2}$	1
Total - - -	$59\frac{1}{2}$	$40\frac{1}{2}$	94	6

State what you notice, and compare your results with Figs. 150 and 151.

* Statistics refer to pre-war conditions.

2. Make diagrams to illustrate the table below.

COUNTRY.	ANIMALS IN WESTERN EUROPE (PERCENTAGES).	
	Cattle.	Sheep.
United Kingdom - -	23	52½
Germany - - -	40	13½
France - - - -	27	30½
Belgium - - - -	3	½
Holland - - - -	4	1½
Denmark - - - -	3	1½
Total - - - -	100	100

State what you notice, and compare your results with Figs. 148 and 149.

3. Make diagrams to illustrate the table below.

COUNTRY.	COAL AND IRON IN WESTERN EUROPE (PERCENTAGES).			
	Coal mined.	Iron ore mined.	Pig-iron made.	Steel made.
United Kingdom - -	50	31	38	29
Germany - - -	39	52	46	52
France - - - -	6½	17	12	9½
Belgium - - - -	4½	—	4	9½
Total - - - -	100	100	100	100
Fraction of world - -	½	⅓	½	½

State what you notice. The United Kingdom exports coal, and Germany, France, Holland and Denmark import it. The values, in million pounds sterling, of iron and steel goods and machinery exported by France, Germany and Belgium are respectively 6, 54, 9.

4. Draw a sketch map of Western Europe (Fig. 147). Insert and name, with boundaries, France, Belgium, Holland, Germany and Denmark. Insert and name the Rhine, Seine and Elbe, as well as Hamburg, Berlin, Cologne, Rotterdam, Antwerp, Havre, Paris, Bordeaux, Marseilles, London, Hull and Liverpool. Shade on your map the area where winter rains occur.

The density of population.—Fig. 128 shows that there is a dense population in Western Europe from the coast eastwards between parallels 50° and 53° N. This district includes north-east France,

Belgium, Holland, the Rhine valley, Hanover and Saxony. Similarly crowded districts occur in the Rhone valley near Lyons, and near the Southern Pennines in South Lancashire and Yorkshire.



- | | | | |
|------------------|--------------|------------------|----------------|
| 1. Turcoing. | 8. Brussels. | 15. St. Etienne. | 22. Dortmund. |
| 2. Roubaix. | 9. Antwerp. | 16. Saarbrücken. | 23. Bielefeld. |
| 3. Lille. | 10. Ghent. | 17. Rotterdam. | 24. Hamburg. |
| 4. Cambrai. | 11. Dunkirk. | 18. Bonn. | 25. Berlin. |
| 5. Valenciennes. | 12. Havre. | 19. Cologne. | 26. Stettin. |
| 6. Mons. | 13. Rouen. | 20. Düsseldorf. | 27. Breslau. |
| 7. Charleroi. | 14. Paris. | 21. Essen. | |

Coal mining.—Fig. 147 shows the districts where coal is mined. The coal mines occur in the areas crowded with people. The German mines are near **Dortmund**, **Breslau** and **Bonn**; the Belgian mines centre round **Mons** and **Charleroi**; and the French mines occur near **Valenciennes**, on a continuation of the Dortmund-Mons coalfield, and at **Saarbrücken** and **St. Etienne**. (Fig. 152).

The mines of the United Kingdom will be treated in a later chapter. Half the world's coal is mined in Western Europe, and

on the Continent there is a vast trade in coal. France gets coal from England, Belgium and Germany. Germany and Denmark import English coal at their Baltic ports.

Iron manufactures.—Iron ore is mined, and machinery, hardware, and other goods made of cast and wrought iron and steel are manufactured near the coalfields. The German works are near **Dortmund** and **Bonn**; the Belgian works centre round **Liège** and **Namur**; and the French works are near **Saarbrücken**, **Briey** and **Nancy**.

Textile manufactures.—The area of dense population is due to the coal mines, the ironworks and the textile factories, where goods are made from cotton, wool, silk and flax.

Cotton goods are made near **Rouen**, **Lille**, **Ghent**, **Düsseldorf**, and **Cologne**.

Woollen goods are produced at **Roubaix**, **Turcoing**, **Verviers**, **Barmen** and **Aachen**.

Silk goods are the product of the **Lyons** district and **Crefeld**.

Linen goods are made from flax at **Lille**, **Cambrai**, **Courtrai**, **Tournai**, **Ghent** and **Bielefeld**.

Cotton is chiefly imported from the United States; wool is produced locally (see the sheep map, Fig. 149), and is imported from Australia and the Argentine; silk is obtained from the south of France, North Italy and China; and flax is largely grown in Belgium.

In consequence of these manufactures, many ports have grown up to facilitate the import of raw materials and the export of the finished products. **Havre** and **Dunkirk** in France, **Antwerp** in Belgium, and **Rotterdam** in Holland are the chief of these ports; while the great river ports of **Cologne** and **Düsseldorf** are on the Rhine.

Farmers in Western Europe.—Although the greatest manufacturer in the world, it must not be thought that the Western European does not till the ground nor make use of the fertile soil, the sunshine, and the rainfall which his lands receive. In the first place, there are many articles of food which must be produced near the places where they are eaten. For example, green vegetables and milk cannot be kept for any great length of time in a satisfactory condition for food; therefore, in the neighbourhood of the dense factory populations of Western Europe, there are market gardeners who make a business of supplying vegetables, and dairy-men whose work it is to supply fresh milk. Some of the farmers make butter and cheese, but the local supplies of these foods are insufficient, and consequently English people eat butter and cheese

from Australia or Canada, and consume preserved milk from Switzerland.

Cheshire is the market garden for the towns of south-east Lancashire; round London, and other large cities such as Paris, the land is almost entirely given up to the market gardener and the dairyman.

Pastoral farming.—The meat which reaches Western Europe from the prairies, etc., is only intended to supplement the supplies obtained from the local farms, and consequently in Western Europe there are many areas where cattle and sheep are reared extensively for the purpose of selling them to the butcher. The most important of these districts are marked upon Fig. 148, where it will be seen that as a general rule cattle are reared upon the lowlands, such as Lancashire and Cheshire, Denmark, Holland, Belgium, and the north-west of France. Sheep, however, are largely reared upon the hills, such as the uplands of Wales and southern Scotland, and the central uplands of France (Fig. 149).

Arable farming.—In the United States *cereal farming* occupies the attention of the inhabitants in a belt of country which lies near to the northern border, and south of this belt lie the belts of country where *tobacco*, and, further south, *cotton*, are largely cultivated (Chap. 33). In Western Europe, there is a distinct belt of country where *wheat* is largely grown. It extends from the eastern counties of England, across the North Sea into the north-east of France and Belgium (Fig. 150). North of this belt, in a colder region, occurs the belt where *rye* is the chief cereal grown (Fig. 151).

The farmer of Western Europe grows wheat and rye as well as he can for the needs of the population, but only one country in Western Europe, *i.e.* France, is able to produce almost sufficient wheat for its own population; all the others are compelled to obtain supplies from overseas. London is the greatest wheat market in the world, and the price of wheat in the London market determines the prices at which wheat is sold in both France and Germany, as well as the prices which the grower of wheat can obtain for his sacks of corn in Australia, in India, in Argentina and in New York.

The price of wheat in London depends upon the success of the crop of the English farmer; if it be a good crop, then there is no need for large supplies of wheat from abroad, and prices abroad are low just as prices in London are low. On the other hand, if the English crop is poor, then London requires larger supplies from

abroad, and prices in London and in the rest of the world may become higher, because there is not sufficient wheat in the world as a whole to supply everybody's requirements.

Other farm work.—The farmer of Western Europe does not confine his attention, like the prairie farmer, to animals, or to cereals

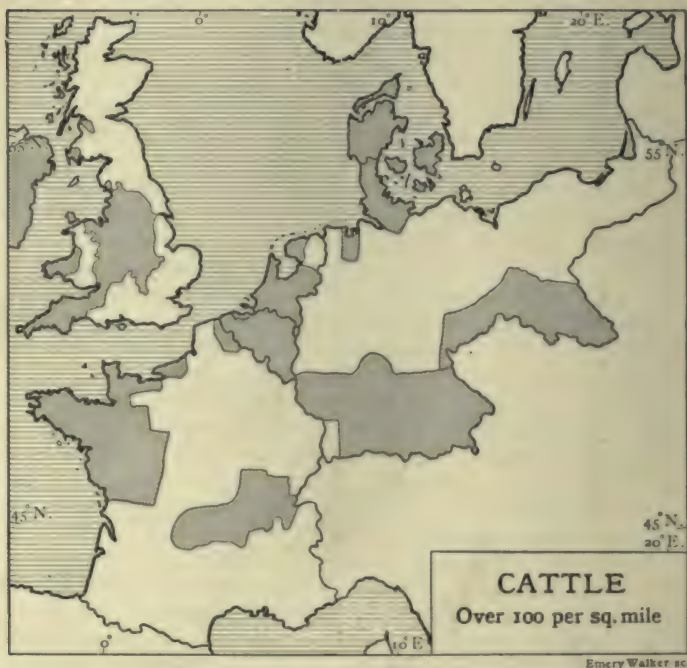


FIG. 148.

(Compare Fig. 160 with this map. As in the case of Argentina, many cattle are reared where there are few sheep.)

alone: he farms for both animals and cereals, and in addition grows root crops, such as potatoes, sugar beets (Fig. 149), to meet the needs of human beings and of animals, such as cattle, sheep and draught horses. The farmer of Western Europe is therefore described as a *mixed farmer*, and he grows such crops as his soil will grow well in the climate which he finds in his district. The farmer of northern Germany, where it is colder during the winter, cultivates rye rather

than wheat, because his climate is colder. On the other hand, the farmer in the south of Germany and the south of France cultivates grapes, and in Germany tobacco, because his climate is warmer.

The influence of history.—Hundreds of years ago, before the invention of railways and steamships, each district in Western



FIG. 149.

(*No district on the Continent has more than 300 sheep per square mile: for details of Britain see Fig. 161. Compare also Figs. 149 and 151.)

Europe grew its own food supplies, and during the early part of the last century farming developed very extensively, new crops, such as the potato, were grown on a large scale, and men began to eat more wheat in preference to oats, for example in the north of England, in Lancashire and Yorkshire. At the same time, as men were withdrawn from the fields to work in the factories, farming became more elaborate. Therefore, the farmer in Western Europe was

compelled to be a mixed farmer, to grow cereals, to produce meat for the butcher, and to produce milk and potatoes for the people of the neighbouring towns. Consequently, even the farm land of Western Europe is well populated; the fields are small, and much more manual work is expended on the farms, and much less labour saving machinery is used.



FIG. 150.

(The chief wheat areas of Western Europe are on the warm side of the January Isotherm 32° F.)

The influence of the past years, therefore, has forced the farmer of Western Europe to differ entirely from the prairie farmer. When we read of the great wheat farms of the United States and Canada, of the large cattle estancias of South America, we are apt to forget that the farmer of Western Europe is equally important, that although farming in Western Europe is carried on by each farmer

on a smaller scale, yet the sum total of the work of these many small farmers is more important for the world than the work of the overseas farmer, who frequently does not get the most out of his soil and his climate.

Towns and communications.—The towns of Western Europe include **Paris** and **Berlin**, two of the largest cities in the world. The

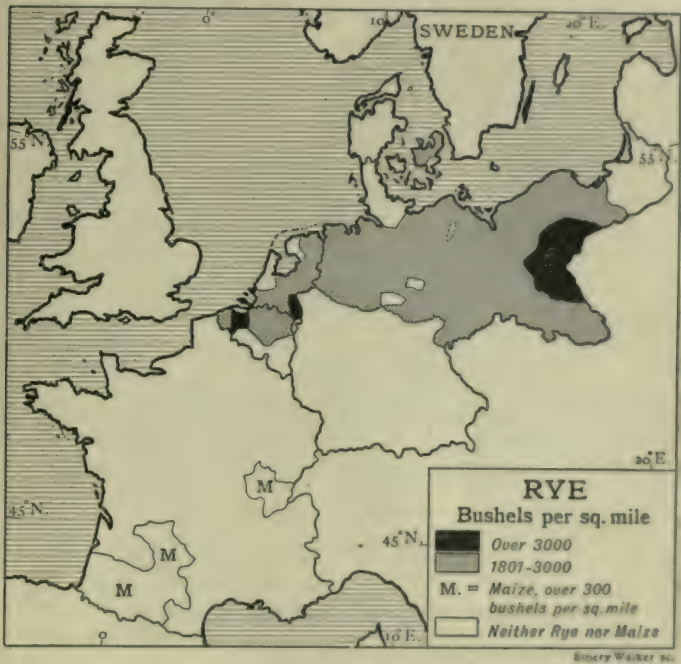


FIG. 151

(The chief rye areas are colder than 32° F. in January; the chief maize districts are warmer than 66° F. in July.)

valleys of the rivers which flow into the North Sea and English Channel contain the majority of the other large towns (Fig. 147). These rivers are navigable for great distances (Fig. 147), and are extensively used for the transport of goods and food-stuffs.

Paris is a river port on the Seine; traffic is carried on by means of barges (Fig. 153) with **Rouen** and **Havre** further down stream. But

the city is the heart of France. All French life centres on Paris; the railways (Fig. 152) radiate from the city in all directions.

Because of the extent of the European plain, rivers have long provided the routes whereby men travelled or traded. During the



FIG. 152.—THE SITUATION OF PARIS.

(Note how the railway lines miss the obstacles of the Central Highlands of France and the Pyrenees; and pass from Besançon to Basle by the Gate of Burgundy, from Bordeaux to the Mediterranean by the Gate of Toulouse, from Grenoble to Turin through the Alps by the Mount Cenis Tunnel.)

second half of the nineteenth century, after the invention of the steam-engine, railways were made to connect the great towns, and consequently the railway lines frequently follow the river valleys. The river traders were not willing to lose all their traffic, and the

Seine, Rhine and Elbe have been improved as waterways by means of engineering works, and canals have been constructed to facilitate movement from the Seine to the Rhine: consequently, North-east France, Belgium and Holland are a network of navigable waterways, both natural and artificial. Recently, railway transport has become cheaper, and railways have been built across uplands, so that towns which lack water communication have communication by land. For these reasons it is probable that water transport will



FIG. 153.—THE PORT OF PARIS.

Photo B. C. Watts

decline and railway transport improve on account of its speed and certainty. Therefore, the railway facilities of Western Europe will be gradually extended until the present network is even more closely meshed.

EXERCISES.

1. Where are four of the most important industrial regions of *either* Western Europe, excluding the British Isles, *or* North America? What are the most important things made in each? (*Sc. Ed. Dept.)

2. In what parts of Europe, outside Britain, are the following occupations carried on, and why: (a) cutting of timber, (b) making of wine, (c) sea-fishing, (d) growing of wheat? (C.P.)

3. Locate the chief coalfields of continental Europe, naming the chief towns and the chief industries of each. (C.P.)

4. Give an example of a district on the Continent in which there are many fairly large towns situated close together. Mention some of the geographical causes which have brought this about in the district you mention. Add a sketch map. (*O.U.L.)

TEST PAPER.

1. On an outline map of Europe :

- (a) Write "coal," "wheat," "wine," "timber," over places noted for these things. Confine yourself to two places in each case.
- (b) Insert the following names in their proper places : Rhone, Carpathians, Elba, Bohemia, Tagus, Crete.
- (c) Show by a dot the position of the following towns, and write the name of each close to the dot : Lille, Oporto, Amsterdam, Stockholm, Buda-Pest, Riga, Hamburg, Palermo, Geneva.

(Sc. Ed. Dept.)

2. Choose any *one* of the following : the south-west corner of France, the Rhine valley, Northern Russia, Switzerland.

Write a short description of it under the headings :

- (a) Nature of surface ;
- (b) Kind of climate ;
- (c) Effect of (a) and (b) on inhabitants.

(*C.P.)

3. How is it that :

- (a) There is less rain in Madrid than in Lisbon ?
- (b) Rye is grown instead of wheat in North Germany ?
- (c) Antwerp is a great port ?
- (d) Baku is an important town ?

4. Explain :

- (a) Why forests are more extensive in Sweden than in Norway ;
- (b) Why Switzerland is a rich manufacturing country with a large trade, although it has no coal nor sea-ports ;
- (c) Why most of the towns of Spain are on or near the coast ;
- (d) Why Hamburg is a great port.

(C.P.)

BRITISH ISLES

English Miles

0 50 100 150

below 600 feet
600 to 3000 "
above 3000 "



SECTION VI. THE BRITISH ISLES.

43. The British Isles.

1. Make a rectangle 10 inches by 7 inches. The two short sides represent parallels 49° and 59° N. respectively. Bisect the short sides and join the mid-points by a straight line to make meridian 4° W. Divide parallel 49° into six equal parts, so that each part measures 2° of longitude.

Along parallel 59° N. mark off equal parts, 1 inch long, to represent 2° of longitude at this latitude. Join corresponding points. Divide the long sides into five equal parts and join corresponding points.

This gives the network (Fig. 155) for a map of the British Isles.

Practise drawing the network until you can do it rapidly. Proceed to learn the coast-line by drawing first the main points at which the coast cuts the network, and then the full outline.

Practise drawing such outline maps.

Keep the best attempts to summarise particulars of various kinds as you read the rest of the book.

2. Practise drawing so much of the above network as is necessary for an outline map of England and Wales.

3. Practise similarly with Scotland and Ireland.

4. Insert on an outline map of the British Isles the rivers which are named on Fig. 154.

5. Insert on an outline map, by means of shading, the land which is more than 600 feet above sea level. Name the Aire gap, the Tyne gap, the Cheshire gate, the Rift valley, and Glenmore. Name the Northern Highlands of Scotland, the central uplands of Britain and their southern portion, the

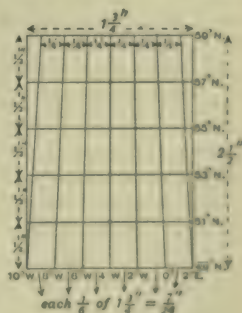


FIG. 155.

Pennines, the Cumbrian upland, the Cambrian upland, the Grampians. Learn this map thoroughly, so that you can reproduce it quickly from memory.

Position.—**Britain** is a world-centre. The British archipelago lies round the centre of the land hemisphere (Fig. 81). To the east the North Sea and the Baltic, connected by the Kiel Canal (Fig. 147), stretch as a sea-route to the heart of Europe. Westwards the Atlantic Ocean makes an open highway for traffic to America. The English Channel to the south gives communication to France, and leads to the sea-road via the Mediterranean or the alternative track round the Cape of Good Hope: these routes make possible oceanic communication with the **Near East**, with its centre at Constantinople, with the **Middle East**, centred round India, and with the **Far East**, which has Japan for its uttermost limit.

Relief.—The United Kingdom is related to Europe in two ways. First, the uplands of Scotland, the *Northern Highlands* and the *Grampians*, as well as the *Pennines*, *Cumbrian* and *Cambrian* uplands, are related to the uplands of Norway. In the second and more important particular, the lowland of South-east England is essentially part of the great Eurasian plain (Fig. 147). Ireland has uplands in the north related to those of Scotland, and uplands in the south related to those of Wales and North England.

The undulations in the south-east of England, which give rise to the hills called the *South* and *North Downs*, are related to similar undulations in the north-east of France and in Belgium. The sea-farer who follows the coasts of Sussex and Kent, and notes the white chalk cliffs which form the terminations of these hills, would find similar cliffs on the French coast.

British rivers.—Rivers as a rule have a course which roughly comprises three parts—a portion near the source, where the slope is steep, where the bed is stony and the current rapid; a portion in the middle, where the slope is less and where the bed contains but small stones and pebbles; and finally, a lower portion near the mouth, where there is practically no slope and where the river moves gently, and the bed is mud or sand.

Most British rivers are characterised by the great length of the lower portion and by the extreme shortness of the upper portion.

Many rivers begin as rocky streams, but ere long the stream becomes gentle and slow-flowing.

The ocean rises and falls with the movement of the tide about

twice per day, and the rise and fall of the tide in the British seas is very marked.

The **tide**, therefore, has much influence on the rivers. When the tide comes in, many English rivers cease to flow seawards along their lower portions ; the water rises, and when the tide is very high the rivers tend to overflow their banks ; consequently, many rivers flow between artificial embankments.

When the tide turns, the river and sea water rush outwards with great force and scour out the estuaries of the rivers, so as to make deep channels in the bed of the stream.

Consequently, many of the estuaries are exceedingly large and wide in comparison with the small rivers which flow into them. Part of this difference is, no doubt, due to a gradual sinking of the land, but part of it is also due to the great scour of the tides twice a day.

The size of the estuaries has been of exceptional advantage to the development of British shipping. When ships were small they could penetrate far up the rivers during the period when the tide was in ; as the ships grew larger, the wide estuaries provided a safe anchorage ; and as the ships became larger still, it was possible to dredge definite channels in the estuaries and maintain these channels free from sand and mud for the passage of the ships.

The Thames, Mersey and Clyde estuaries are continuously dredged to maintain a fairway for the ships which use the ports of **London**, **Liverpool**, **Manchester** and **Glasgow**. The Firths of Forth and Tay and the Bristol Channel do not require dredging on so great a scale, and ships use these estuaries to reach **Leith**, **Dundee**, **Cardiff** and **Bristol**.

Upland barriers.—Uplands frequently form barriers to traffic and communication between different parts of a country. Before the days of railways, the Pennines separated the east coast lands of Yorkshire, Durham, etc., from the west coast lands of Lancashire and Cheshire. About a century ago, travellers journeyed to Scotland by coach along either the east coast route through **York** and **Berwick**, or along the west coast route through **Warrington**, **Preston** and **Carlisle**. Across the Pennines there was very little traffic or communication : in the north, the **Tyne Gap** was used for a track for horses ; in the centre, the **Aire Gap** led from Leeds to Preston or Liverpool, and traffic passed this route along the Leeds and Liverpool canal ; and in the south, the **Trent valley** curves round from the east side to the west side, and was used for roads and canals as well as river traffic.

But, at this time, North England was beginning to be a seat of manufactures ; and, consequently, canals were built from Lancashire into Yorkshire and from Derbyshire into Nottinghamshire. In many places these canals were built on viaducts across valleys and across rivers, and through tunnels under the hills. About the same period, roads were improved from tracks with a dirt surface to roads with a stone surface (macadam), similar to that in use to-day. But the Pennines still proved a barrier.

Since the first railways were built between 1830 and 1840, the Pennines have been crossed and tunnelled by innumerable iron-roads, and to-day the Pennines have lost their importance as a barrier.

The Grampians and the northern uplands of Scotland, however, still retain their importance as a hindrance to traffic and communication. The railways usually go round the uplands near the coast (Fig. 158), and trains cross the hills by few routes and at comparatively infrequent intervals. This difference between the uplands and their effect on man is largely due to the fact that in the north few people live near the uplands ; while, in the south, the belt of country between the Ribble and the Mersey, from the coast of the Irish Sea over the Pennines to beyond the longitude of Leeds, is one of the most densely populated districts in the world (Figs. 164-171). Consequently, in the north it has not *paid* men to build many lines of communication, while in the south the imperative necessity of trade has forced men to undertake engineering works to conquer nature.

Similarly, in Wales, the upland is rarely crossed, while the lowland, both in the north and in the south, is a route for traffic which is extensively used (Fig. 158).

The Aire gap and the Tyne gap lack the importance of the Rift valley of Central Scotland. This valley is the narrowest portion of the island of Great Britain, and the estuaries of the Clyde and Forth have brought every portion of this lowland within easy reach of the sea.

Climate.—In comparison with the rest of the world, the United Kingdom has a climate due to the prevailing westerly winds of the North Atlantic Ocean. It has variable rainfall of the type of Bordeaux (Fig. 47), and has specially warm winters (Figs. 59 and 60). Because of these facts Britain is populous and the home of a great people, while Sakhalien and Labrador are frozen wastes (pp. 87-8).

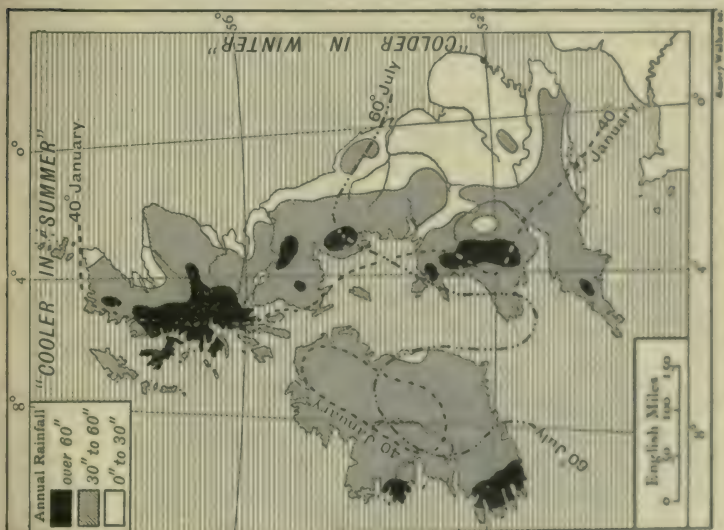


FIG. 156.—BRITISH ISLES: CLIMATE.

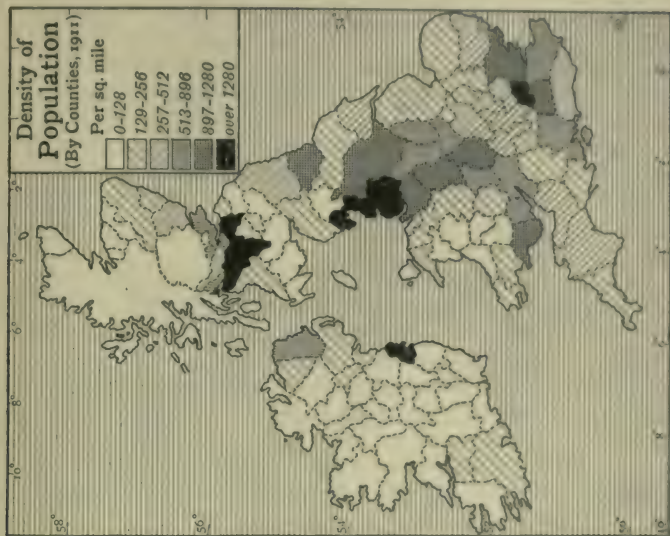


FIG. 157.—BRITISH ISLES: DENSITY OF POPULATION BY COUNTIES.

Temperature divisions.—Fig. 156 shows the two isotherms, January 40° F. and July 60° F. The January isotherm goes roughly north and south, so that in winter the west is warmer than the east ; and the July isotherm goes roughly east and west, so that in summer the north is cooler than the south. The average temperature throughout the year in Britain is, therefore, about 50° F., with a variation of 10° F. between the minimum and the average and between the maximum and the average. In the north-west the variation is less than 10° F. above or below, and in the south-east the variation is greater than 10° F.

Consequently, the British Isles contain four temperature regions. The south-west is warmer than the north-east practically all the year round ; while the south-east has the more extreme, and the north-west the more equable climate.

Rainfall.—Fig. 156 shows that, on the whole, the rainy regions of the British Isles are the western uplands. As a general rule the uplands are rainier than the neighbouring lowlands (p. 67) ; but this difference depends upon the position of the ridges in regard to the winds. In the case of the southern Pennines, the land about 600 feet high has a rainfall of about 40 inches annually on the west, but only 30 inches on the east (Fig. 48).

Sunshine.—Fig. 140 shows the relation between the sunshine of Britain and that of Europe. Scotland has about as much sunshine as Scandinavia and the tundras of Lapland. Ireland, England and Wales have sunshine to the same extent as the German lowland and as the forest region of Russia. France, Switzerland and South Russia are sunnier than Britain ; and the Mediterranean lands are sunnier still.

SUMMARY.

Britain is the centre of the land hemisphere.

The British Archipelago lies to the west of the European peninsula.

The western uplands of Britain are related to the western uplands of Scandinavia.

South-east England forms part of the Great Eurasian plain.

Britain contain four climate divisions : the N.W. is most equable, wettest, and least sunny ; the S.E. is most extreme, driest, and sunniest.

The climate of Britain depends mainly upon the westerly winds, and is exceptionally warm in winter.

EXERCISE.

1. If the sea-level rose 600 feet all the lowland parts of Great Britain would be submerged. Describe shortly, or show by a sketch, what the map of Great Britain would then be like. (O. U. L.)

44. Britain.—Farming; Population.

1. Make a set of outline maps of Britain to show the land which is higher than 600 feet above sea-level. Mark on these, in turn :

- (a) the chief wheat-growing districts, from Fig. 158 ;
- (b) the chief oats-growing districts, from Fig. 159 ;
- (c) the chief sheep-rearing districts, *i.e.* where there are more than 300 sheep per square mile, from Fig. 161 ;
- (d) the chief cattle-rearing districts, *i.e.* where there are more than 100 cattle per square mile, from Fig. 160.

Make brief statements of the facts which you learn from each map you make. When you have written the facts regarding Britain, then make a comparison between Britain and Western Europe (Figs. 148-151).

2. Make two outline maps showing land higher than 600 feet above sea-level. Mark on the first the districts of dense population from Fig. 157, and on the second the areas where there are coal-fields from Fig. 163. Write brief statements of what you learn from these maps ; and then write a brief statement to show the difference between the coal-fields and the farming districts as centres of dense population.

Natural vegetation.—Britain is by nature a region of forests on the lowlands, and grass, heather, and gorse on the uplands. Man has so far conquered nature that the forests have disappeared almost entirely (p. 96), and that the lowlands have been tilled so extensively and carefully as to produce on the whole about half the foodstuffs needed for the population. The natural vegetation shows the effect of the climate. In the first place, the land is rainy enough to grow trees, as in Finland and Sweden ; in the second place, the uplands are colder than the lowlands, and bear stunted coniferous trees, or heather. The uplands, according to their latitude, should be snow-covered throughout the year, and the Northern Highlands should be covered with perpetual snow-fields like the mountains of Norway, but the special winter warmth brought by the **westerlies** prevents the accumulation of snow throughout the winter. Snow falls on the hills, but rarely remains throughout the winter, except in the most exposed portions ; and the return of spring usually coincides with the final melting of the snow.



FIG. 158.—BRITISH ISLES: WHEAT.



FIG. 159.—BRITISH ISLES: OATS.



FIG. 161.—BRITISH ISLES : SHEEP.



FIG. 160.—BRITISH ISLES : CATTLE.

Farming.—The eastern counties, which are the driest and sunniest portions of Britain, produce **wheat** (Fig. 158). The district is lowland and forms part of the wheat belt of Europe (Fig. 150). For many years this area has produced about one-fifth of the wheat eaten in Britain, so that we eat bread from flour which is a mixture of the produce of our own wheat-fields and those of Canada, India, Australia, the United States, the Argentine and Russia (Fig. 73).

Fig. 151 shows that Britain does not grow rye, although the climate of parts of Britain is similar to the climate of the rye belt of Europe. The British farmer finds that Britons do not eat rye like the Germans and the Danes, consequently he grows **oats** instead of rye. The oats-growing areas of Britain are chiefly in Ireland, in the north-east and in the south-east. On the whole, oats are grown on the lowlands, which are wetter and cooler than the wheat districts of the eastern counties.

Sheep are reared on the uplands, especially on the **Cheviots** and Cambrian uplands (Fig. 161). No other portion of Western Europe has so many sheep as 300 per square mile, and only a small part of the area has over 150 per square mile (Fig. 149). Consequently, Britain is the greatest sheep-rearing country of Western Europe. In comparison to its size, Britain is a greater sheep country than New Zealand (Fig. 95).

Cattle are reared mostly on the wetter western lowlands (Fig. 160).

Parts of Ireland are like parts of Holland, Belgium and Denmark, where there are more than 200 head of cattle per square mile.

Root crops, such as **potatoes** (Fig. 162) and turnips, are grown by the British farmer for food for man and cattle. On the whole, potatoes are chiefly grown in the cattle districts on the wetter lowlands. On the Continent, perhaps the most important root crop is the **sugar beet** (Fig. 149). This root is grown in Holland, Belgium and Denmark, wherever the ground is not largely used for rye (cf. Figs. 149 and 151), and in the districts where there are many cattle (Fig. 148). Potatoes are also grown on the Continent in similar areas; consequently sugar beets could be grown in Britain, although the British farmer does not grow sugar beets because it pays him better to produce other crops. The absence of sugar beets in Britain is partly due to an Imperial reason also: in the days when Europe began to grow sugar beets, Britons consumed cane sugar brought from the British West Indian plantations, and



Stanford's Geog. Estab., London

FIG 163.—BRITISH ISLES: COAL AND IRON.



FIG 162.—BRITISH ISLES: POTATOES.

although Britons now consume beet sugar almost entirely the British farmer has not found it advisable to change the kind of root crops which he grows.

Coal fields.—The most important mineral in Britain is coal. Britons mine about one-fourth of the world's coal. A line drawn on the map (Fig. 163) from Dundee to Derby, and then with a slight curve between Bristol and Cardiff, would separate pairs of coal fields which lie opposite to each other across this line.

On the west side of the Rift valley lie the coal fields of the Clyde and Ayrshire ; on the east are the smaller coal fields of Midlothian and Fife. Further south the coal field of Northumberland and Durham, on both sides of the lower Tyne, lies opposite the Cumberland coal field. The Southern Pennines separate the south-east Lancashire field on the western slopes from the York, Derby and Nottingham field on the eastern slopes. The North Staffordshire and South Staffordshire fields are separated by the Trent, which also separates the Leicestershire field on the east from that of Nottingham. The Severn estuary separates the coal field of South Wales from that near Bristol.

On these eleven fields (Fig. 163) about one million workers deal directly with the coal itself, either above or below ground.

Iron and other minerals.—**Iron ore** is the mineral of second importance which is mined in Britain. As a rule, the ore is mined on the coal fields ; in some cases it is raised by the same pit-shaft as the coal.

Iron is mined away from the coal fields in Yorkshire, in **Cleveland**, near **Middlesbrough**, and in North Lancashire, in **Furness**, near **Barrow** (Fig. 163). An iron field of growing importance occurs near Gainsborough in Lincolnshire.

No other minerals of great importance are now mined. Centuries ago tin was mined in Cornwall ; in Roman times tin was the chief British product. Gold has been mined in small places on the Cambrian upland, and lead used to be mined in many places on the Derbyshire Pennines.

But the discovery of deposits of these minerals in other countries has reduced the prices of gold and tin and lead so much that it no longer pays to mine for these metals on the same scale as in times past.

Population.—Fig. 157 shows the distribution of population in Britain. The Scottish Rift valley, the Tyne coal field, the Southern Pennines, North and South Staffordshire, South Wales, the area

immediately round London, and the district round Belfast, in North-east Ireland, are areas of dense population. London, the largest city in the world, has a dense population, because it is the capital of Britain, the mother-city of the British Empire, and one of the world's largest ports. The Belfast area is peopled densely, because there are extensive shipbuilding works, which gain their coal from the neighbouring coal fields across the Irish Sea.

The other areas are all on or near the coal fields, although the dense population which gathers round the pit-heads does not entirely account for the appearance of these areas on the map (Fig. 157).

The areas of least dense population are on the uplands of Scotland and Ireland, these being areas which do not produce crops or rear animals at all extensively.

The greater portion of the district north of the Rift valley is given up to grouse moors and deer forests, where wealthy people gather in the autumn for sport. For these purposes high rents are paid for the land.

Similar upland districts in the Cheviots and the Northern Pennines have a sparse population.

Between these two extremes are the farming districts. The denser population in the farming areas lies near the coal fields, and near the Metropolis.

The farm lands of Cheshire, and those of Middlesex, Hertfordshire and Northamptonshire are densely peopled farm lands, because the crowded districts compel farmers to cultivate smaller patches of ground as garden, or dairy, farms to supply the cities with milk and fresh vegetables.

The population of Scotland and Wales, therefore, depends on the climate and vegetation of the uplands and on the coal fields of the lowlands.

The population of Ireland depends on the industries of Belfast, and elsewhere on the lowlands of the river valleys.

In England, on the whole, the population is not dependent upon relief, climate or vegetation : it is almost entirely controlled by the position of the coal fields and the crowds of people who work thereon. This independence marks the manner in which man overcomes the limitations which nature places in his way.

SUMMARY.

Britain provides about half the nation's food supply ; the rest is imported.

British farmers grow wheat in the dry sunny east, and oats and potatoes on the rainier west. They rear sheep on the uplands and cattle on the lowlands.

Many Britons are market gardeners, or dairy farmers.

About a million Britons work in connection with coal, which is mined in eleven important coal fields.

On each coal field many people live crowded together in towns ; some are miners ; others work in iron or steel ; others work in factories.

EXERCISES.

1. What part of the British Isles has the highest average temperature, and what part the lowest, (a) in July and (b) in January? In each case give a reason. (C. U. L.)

2. Compare the climates of South-east and South-west England (say of Kent and Cornwall) in winter and summer, and give reasons for any differences. (L. U.)

3. How is rainfall measured? Where does most rain fall in the British Isles? Where least? Explain as fully as you can. (L. U.)

4. The mean annual rainfall at Edinburgh is 30 inches. Explain fully the meaning of this statement.

State the districts in Scotland which have the greatest and least annual rainfall, and account for the facts. (*O. U. L.)

5. State and explain the reasons why the eastern counties of England are specially important in the cultivation of wheat. (*O. U. L.)

6. Account for the sparse population of Ireland ; state in what part population is thickest ; name two chief towns in that part ; give reasons for the greater density there ; what is the chief occupation of the people in Ireland. (*C. U. L.)

7. Why is there such a difference in the producing power of the Highlands and Lowlands of Scotland, with respect to both mineral and vegetable products? (C. P.)

45. The Growth of an Industrial District.

1. Make an outline map of the United Kingdom. Insert London, Cardiff, Swansea, Birmingham, Leicester, Nottingham, Derby, Sheffield, Leeds, Manchester, Liverpool, Blackburn, Hull, Newcastle-on-Tyne, Stoke, Glasgow, Dundee, Belfast. Mark by means of a boundary the area shown in Fig. 164.

These places are centres of industry in Britain ; write a note pointing out the relation of these places to the coal fields.

2. Write a brief note stating with regard to cotton, wool and iron ore, (i) where they are produced ; (ii) which countries send supplies of these things to the United Kingdom. (Refer to the index for the pages in this book on which these commodities are mentioned.)

The Census.—Every ten years since 1801 the population of the United Kingdom has been counted ; the last enumeration took place in 1911, and was the twelfth Census. The Census returns provide sufficient information to indicate the changes in the population of the British Isles during the nineteenth century. To show some of these changes the area shown in Fig. 164 has been taken, since it includes the industrial district which stretches across the southern Pennines, and also includes specimens of agricultural England in the counties of Cheshire and Lincoln. This area comprises about one-fourth of England, and includes most of Lancashire, the West Riding and East Riding of Yorkshire, Lincolnshire, Nottinghamshire, Derbyshire, North Staffordshire and Cheshire (Fig. 165).

The Southern Pennines.—The area shown in Fig. 164 includes the lower portion of the Ribble valley, the Aire Gap in the Pennines, the valley of the Aire and part of that of the Yorkshire Ouse, the valley of the Trent, the southern end of the Pennines, which reach their highest points in the **High Peak** of Derbyshire, the valley of the **Weaver** in Cheshire, the valley of the Mersey and that of the **Irwell**.

On the west near the coast the land is low ; the basin of the **Irwell** is low and is almost surrounded by the Pennines, which rise rather suddenly from the lowland. On the east, long valleys lead from the Pennine Upland down to the lowland in which the Yorkshire Ouse flows, and beyond the Ouse lies the valley of the **Derwent**, with the Yorkshire Wolds on the south side.

In the south, the Pennines send down long ridges towards the Trent ; between these ridges lie the valleys of the **Dove**, the **Derwent** and the **Erewash**. Beyond the Trent to the south the land rises in the gentle hills of the Midlands, and in Lincolnshire there is the slight ridge which forms the **Lincoln Wolds**. The Cheshire plain is not flat, but has gentle undulations which form the water-parting of the Weaver.

Population in 1801.—At the beginning of the nineteenth century, the population east of a line which passes north and south just east of

Leeds and Nottingham was less than 128 per square mile, except round the port of Hull.

On the Pennines in North Derbyshire, *i.e.* in the High Peak, the population was also sparse. The population of the six *urban* or town districts—Liverpool, Manchester-Salford, Leeds, Sheffield, Nottingham, Derby—was over 2048 per square mile. Surrounding Manchester and Leeds, and in North Staffordshire, the population was between 512 and 1024 per square mile.

Population in 1851.—When half the century was gone the density of the population had increased throughout the district except in part of Lincolnshire, in the High Peak, and in the East Riding of Yorkshire.

The areas of dense population had increased in size, *e.g.* Liverpool had expanded across the Mersey estuary to include **Birkenhead**, which was sparsely populated farm land when the century opened. The Leeds area had spread to include **Bradford**, and the Manchester area had spread eastwards. In North Staffordshire there had arisen a dense population round **Stoke**.

From the west coast, between the Ribble and the Mersey to the north and south line just east of Leeds, the population had increased in density, and between Leeds and Manchester across the Pennines there was an average density of over 1024 per square mile.

Population in 1901.—By the end of the century the changes in population had become more marked. In parts of the East Riding, Lincolnshire and Nottingham the population had declined below 128 per square mile; while, during the same period, the district from Derby and Nottingham city in the south through Chesterfield and Sheffield to Leeds, had become more populous. The Stockport district of Cheshire had increased in density; but the greatest increase was in the belt of country between Leeds on the east and Liverpool on the west.

Changes during the century.—A comparison of Figs. 166 and 168 shows that the greatest increase of population had occurred in the area between Leeds and Liverpool, and that in the eastern counties not only had there been no total increase during the century, but that some districts had increased at first and then declined.

A closer examination of the changes in the population makes it possible to divide this part of England into five kinds of districts. (1) Where the population was five times as great at the end of the century as at the beginning. (2) Where it was only four times as great. (3) Where it was only three times as great. (4) Where the

population doubled itself in the first half of the century, and then remained fairly constant. (5) Where the population was half as big again in 1851 as in 1801, and from 1851 to 1901 either remained stationary or declined.

The rates of change are shown in Fig. 169; the steeper the line the more rapidly the population increased.

Fig. 170 shows where these districts are situated. Round Nottingham and Derby cities, in the Stoke district (the **Potteries**), in the Wirral peninsula of Cheshire, in the Blackpool district of Lancashire, round Hull, and in the Grimsby district of Lincolnshire, as well as in the Lancashire area between the Ribble and the Mersey, and in the Yorkshire areas round Leeds and Bradford, and from Sheffield to Barnsley, the population became five times as numerous. In North Lancashire, in the northern part of the West Riding on the Pennines, in the East Riding, and the whole of the eastern part of Nottinghamshire in the Trent valley, as well as in parts of Staffordshire and Derbyshire in the Trent valley, the population had remained almost stationary. The middle portion of the West Riding had increased greatly, but not so rapidly as in the Leeds or Sheffield districts.

Population and coal-fields.—A comparison of Fig. 171 with the population map shows that the great changes of population occurred almost entirely in the coal-fields. The coal-field of Lancashire fills the basin of the Irwell almost entirely, and on this coal-field are situated the **cotton towns**, with Manchester as their centre and Liverpool as their port.

The coal-field of Yorkshire extends along the eastern slopes of the Pennines southwards beyond Chesterfield to the Erewash Valley which forms the boundary between Derbyshire and Nottinghamshire. On this coal-field are situated the **woollen towns** of the West Riding round Bradford and Leeds, the **iron and steel towns** of South Yorkshire round Sheffield, and further south the **lace and hosiery towns** of Derby and Nottingham.

Consequently, it is safe to say that the coal-fields of the southern Pennines have been intimately associated with the development of a vast army of workers in coal, iron, cotton and wool, who are crowded together across the uplands as well as on the neighbouring lowlands.

Population and communications.—Fig. 164 shows the canals which were made in this district about the beginning of the century. At that time passengers and goods were sent from place to place either by river, by road, or by canal. The rivers (Fig. 164) were not



FIG. 164.—RELIEF AND CANALS.

Emory Walker et.



FIG. 165.—DISTRICTS AND TOWNS.

Emory Walker et.

(The chief towns in each county are numbered; identify them from your atlas.)



FIG. 166.

Emory Walker et.

(Identify the seven densely-peopled districts from Fig. 165.)



FIG. 167.
(Note the growth in the densely-peopled districts.)

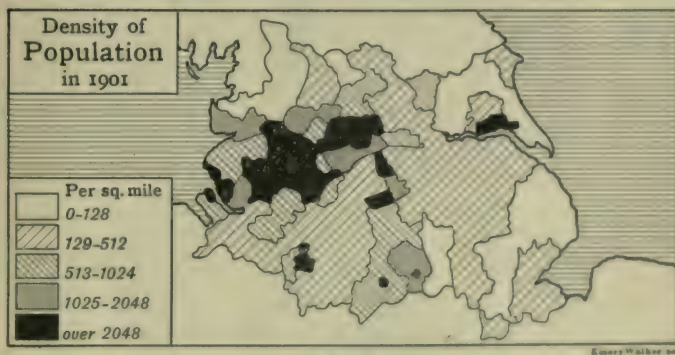


FIG. 168.
(Note the changes in Lancashire and Yorkshire.)

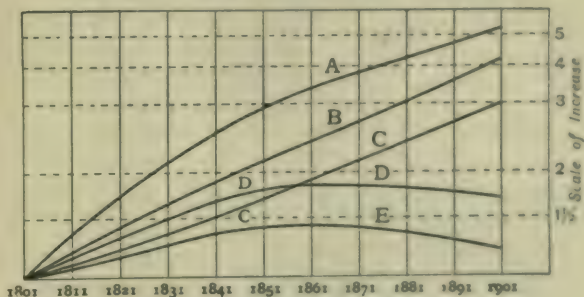


FIG. 169.—RATE OF CHANGE IN POPULATION.
(For meaning of letters A, B, etc., see Fig. 170.)

very useful; boats used them, but there was always danger of delay. Sometimes the water in the river was too shallow, sometimes the time taken by the boats was too long, and there were delays in loading and unloading. The rivers were also limited in their scope; they only served some of the towns.

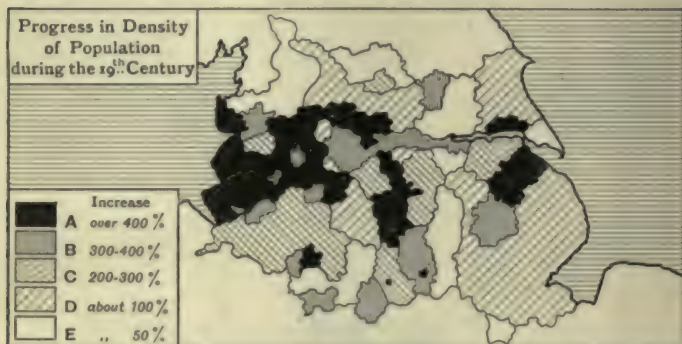


FIG. 170.



FIG. 171.—COAL-FIELDS AND RAILWAYS.

Consequently, for these reasons the roads were used. The roads were bad. Wheeled traffic in carts and waggons was slow, and on some roads throughout the year and on other roads during the winter wheeled traffic was impossible. Such roads were traversed by lines of pack-horses. Consequently, transport was slow and costly.

Canals were, therefore, built. The first was the **Duke of Bridgewater's canal** from his colliery at Worsley to the Irwell. This was extended to pass along by the side of the Mersey to the river estuary. Other canals were made, *e.g.* from Liverpool to Leeds through the Aire gap, from the Mersey to the Trent.

Canal transport was cheap but slow, and poor people used to travel along the canals in passenger barges ; while richer people travelled by stage coach along the roads.

Population and railways.—Roads, rivers and canals were solely used until the first English passenger railway was built between Liverpool and Manchester in 1837. The invention of the steam engine, and the subsequent use of steamboats and railway trains, were largely responsible for the changes in population shown by the maps for 1801 and 1851. For example, Liverpool city expanded eastwards by land, but, as soon as the steam ferry was used, the opposite shore of the estuary in the Wirral peninsula became the home of many people who worked by day in Liverpool and slept in Birkenhead and district. Consequently, Birkenhead changed from a farm-village to a great town. Railways began between Liverpool and Manchester, and consequently the land north of the Mersey became more densely populated than Cheshire across the river.

Since 1851 the railway system has been developed to the extent only partially indicated by the map (Fig. 171), where only the main lines of the railways are shown.

The **Lancashire and Yorkshire Railway** serves this district, and is one of the largest railways which does not run its main line to London. The **Great Central Railway** has developed from the Manchester, Sheffield and Lincolnshire Railway, which used to be limited to this district. The **North Staffordshire Railway** serves Staffordshire and part of Derby. The **London and North-Western Railway** has developed from the first line between Manchester and Liverpool. The **Midland Railway**, which even now has its chief works near Derby, has grown from a small railway which was built in Eastern Derbyshire to connect the Derby coal-field with the manufacturing towns.

Population and farming.—When the century opened, the majority of the people of England were self-centred ; each locality was self-contained, and there was not much exchange of food-stuffs between one district and another. Each household procured a year's supply of grain and stored it in a huge box. As the people crowded into the factory areas, the old system had to be given

up. At first, each family farmed a small piece of land, and worked at cotton or woollen manufacturing in what might be called their spare time. When the people became more numerous, there was not enough land for all, and consequently the farms in the factory districts became market gardens and dairy farms. This fact explains the difference between the population of Cheshire in comparison with the population of the East Riding, Lincolnshire and East Nottinghamshire. Cheshire contains more people; some of them, it is true, are manufacturers, others are salt-miners in the **salt mines of Northwich**, Nantwich and Middlewich; but away from the factories and the mines the people are more numerous, because they farm small areas to supply the factory workers with milk and fresh vegetables, etc.

Population and power.—By **power** is meant the force to work machinery. During the first third of the century there were few steam engines, and machinery was kept in motion by the power of horses or water-wheels. The latter was the more satisfactory method, and consequently the first factories of Lancashire and Yorkshire, as well as the first iron and steel works, were situated on the streams, and were pushed up the valleys towards the sources of the streams because the water runs faster in the upper valleys. Consequently, the early cotton mills lie up the Pennine slopes in a circular sweep from Blackburn on the west round by Burnley and Rochdale to Oldham and Glossop on the east.

When steam-power was adopted, larger factories were built in the same district; for they were near the coal-fields, and railways were constructed to bring the coal cheaply and quickly to the mills. Finally, the cotton towns owe their position to the wetness of the air on the western slopes of the Pennines; they lie as a rule in a district where the annual rainfall is higher than 40 inches per annum, where the sky is more cloudy and the hours of sunshine are less numerous than anywhere else in England (Fig. 140).

Factories and other industries.—The rise of the factories is responsible for the progress of other industries in the same neighbourhood. **Chemicals** are required to bleach the calico; consequently, **St. Helens** is a chemical centre dependent upon the coal of **Wigan** and the salt of Cheshire.

The factory workers require **earthenware**, china and **hardware**; consequently, the dense population provided a market for the china of the **Pottery** district on the North Staffordshire coal-field near Stoke, and for the hardware of the iron-works. The machinery of

the mills, and the rails and locomotives, etc., of the railways, was also provided largely from local iron-works. Consequently, **Crewe** and **Derby** for railway materials, **Oldham** for cotton machinery, became more populous, because the factories and the factory workers created a demand for iron goods.

Industries and ports.—All the cotton which is used has to be imported. Liverpool is the convenient port, and from the traffic in raw cotton inwards and cotton goods outwards, with the addition of the food-stuffs which have to be brought from Ireland and from overseas, Liverpool has grown to be the greatest port in the world except London, which is her equal.

Modern developments caused the construction of the **Manchester Ship Canal**, which has made Manchester a port equal in importance to Glasgow.

Wool is imported chiefly from Australia ; iron is imported from Sweden and Spain, and the Humber provides an estuary on which has grown up the port of **Hull**, which imports wool and iron, exports woollens and coal, and is the third port of the United Kingdom.

Other developments.—The **Blackpool** district has increased in population because the factory workers require holidays. Blackpool has grown into a large town to cater for the thousands of factory hands who spend their annual holiday at the seaside.

Grimsby is the chief fishing port on the east coast, and its rise in population is due almost entirely to the fishing industry. The fish are sent from Grimsby to the factory towns and to London by rail.

SUMMARY.

This sketch of the development of the Southern Pennine area shows the interaction which occurs in the progress of industrial areas. People wish to manufacture and they desire to sell their products ; therefore, railway lines and other means of communication are developed. The ease of communication thus obtained causes the factories to grow ; they want more hands ; consequently, people migrate into the factory area from without. Additional work is thus provided in all departments, and the industries of the district expand further, and so development continues. Progress in one department enforces growth elsewhere, and so South-east Lancashire has become perhaps the most densely peopled district in the world, and certainly the area where man has triumphed most over the forces of nature. Man has spread across the hills, he digs thousands of feet deep for coal, he sends ships to

the ends of the earth to collect raw materials and to distribute the produce of his handiwork.

EXERCISES.

1. What occupations of the people of Lancashire are directly or indirectly due to the existence of the Lancashire coal field? In each case state exactly how the coal-field has influenced the occupation, and mention any other factors which have also influenced it. (C.S.C.)

2. Draw a sketch map of the Trent basin, naming the hills which bound it. Insert and name (a) three tributaries and (b) three principal towns. Name the counties.

Insert in brackets after the name of each town the chief industry carried on there. (*O.U.L.)

3. Write a short description of Yorkshire (boundaries, physical features and natural productions). Name six of its important towns, and state for what they are noted. (*C.U.L.)

4. Draw a map to show the chief towns of the West Riding of Yorkshire. Discuss the nature of its industries, and show how geographical conditions have made the area important. (*Sc. Ed. Dept.)

46. Industrial Britain.

1. On an outline map of England and Wales mark the South Wales coal field.

Insert Cardiff, Merthyr Tydvil, Swansea, Neath and Bristol.

Show the courses of the Severn, Wye, Usk and Taft.

2. On an outline map of England and Wales mark the South Staffordshire coal field. Insert the rivers Trent, Severn and Stratford Avon.

Show the West Coast railway route to Scotland from Fig. 163.

Insert Birmingham, Wolverhampton, Stafford, Coventry, Rugby.

3. On an outline map of England and Wales mark the Durham and Northumberland coal field. Insert the Tyne and Tees. Name the Cleveland iron district. Name Newcastle, Gateshead, Durham, Stockton and Middlesbrough.

Insert the East Coast railway route to Scotland from Fig. 163.

4. On an outline map of Scotland mark the coal fields of the Forth and Clyde, of Fifeshire and of Ayrshire. Insert the Tay, the Forth and the Clyde. Name Glasgow, Ayr, Kilmarnock, Renfrew, Paisley, Hamilton, Edinburgh, Leith, Dunfermline, Dundee, Aberdeen. Show from Fig. 163 the Scottish portions of the East and West Coast railway routes between London and Edinburgh or Glasgow.

5. On an outline map of Ireland mark Belfast, Londonderry, Dublin. Insert Lough Neagh and the Shannon river, naming the Shannon lakes.

British industries.—The chief British industries are the manufacture of cotton, woollen, iron and steel goods ; the mining of coal and iron ; and the smelting of iron, copper and tin ores. These industries centre round the coal fields, and have caused the densities of the population on the coal fields to be higher than elsewhere, except the Metropolitan district (Fig. 157). These changes in population are similar to the changes in population which have occurred in the neighbourhood of the southern Pennines, and have been considered in the last section.

South Wales.—The South Wales coal field extends from **Cardiff** on the east to beyond **Swansea** on the west, and reaches northwards up the slopes of the uplands to **Merthyr Tydvil**. In addition to coal mining, the workers smelt *copper* which is brought from Spain, and *tin* which is brought from the East Indies.

South Wales coal is specially useful for ships, and because of the exports of coal and the imports of ore, Cardiff is the largest port on the Bristol Channel. With the neighbouring ports of Llanelly and Newport, Cardiff imports about one-third of the iron ore imported into Britain.

South Wales is not a great farming district ; the lowlands are chiefly important for cattle and the uplands for sheep (Figs. 160-1) ; the area of dense population does not extend far inland (Fig. 157). Across the Bristol Channel lies the port of **Bristol**, which is connected by land routes with the Midlands round Birmingham and with the agricultural districts to the east and south-east. Consequently, the trade of Cardiff is chiefly an export trade of coal, while the trade of Bristol is chiefly an import trade of provisions and other miscellaneous goods. The two ports, therefore, work together ; ships bring goods to Bristol, cross the Channel *in ballast* to Cardiff, and there obtain a return cargo.

The railway line from London for both ports is the **Great Western** from Paddington. The Cardiff line goes under the Severn estuary by tunnel, and is continued on the South Wales lowland to the west coast to **Fishguard**, which is the port for traffic to Ireland (Fig. 158), and a place of call for ships from Liverpool to America.

South Staffordshire.—The South Staffordshire coal field lies north of **Birmingham** on the slight group of hills which are between the Trent, the Severn and the Stratford Avon. Based on the coal field are the **hardware** factories of **Birmingham**, the **metal works** in brass, copper, zinc and tin of **Wolverhampton**, the **leather works** of

Walsall, and the **cycle and motor works** of Birmingham, Wolverhampton and Coventry.

Since the district is entirely inland, the communications of the area are important. Before railways were available, roads and canals were utilised to convey goods to Liverpool, Hull and Bristol. Railways now run from the district outwards to Liverpool (L. & N.W.R.), to Bristol (G.W.R.) and to London (L. & N.W.R., G.W.R., M.R.). The West Coast route to Scotland from Euston, London, by the L. & N.W.R., crosses the north-east corner of the district on the way to Stafford and Crewe; but Birmingham is sufficiently populous to justify many trains carrying both passengers and goods daily on each of the three railway lines which start at Birmingham and end at London.

The Tyne district.—On both sides of the lower Tyne extends the coal field of Northumberland and Durham. By the river side there are many iron and steel works and shipbuilding yards, of which the centre is **Newcastle**. On the Tees, **Middlesbrough** is an iron centre, coal being obtained from Durham on the north and iron from the Cleveland district to the south.

Newcastle is the great port of the area. It ranks second to Cardiff for its exports of coal, and in total trade ranks higher than either Cardiff or Bristol.

The railway line for the district is the North-Eastern, which forms, with the Great Northern from London, the English portion of the East Coast route to Scotland.

The Scottish Rift Valley.—Between the Grampians to the north and the central uplands of Britain to the south lies the Rift Valley of Scotland. The surface of this area is mainly lowland, although there are slight hills which separate the Tay from the Forth and the Forth from the Clyde.

The Firths of Clyde and Forth penetrate deeply into the land, so that the distance between the North Sea and the Western Ocean is little more than the distance from Manchester to Liverpool. In this area are three coal fields, (i) in South Fife, (ii) between the Forth and Clyde, and (iii) in Ayrshire.

Because of the mining, the iron works, and the other factories, this district is the most populous part of Scotland. Along the southern shores of the Firth of Forth is the best agricultural portion of Scotland, centred on **Edinburgh**, and along the Firths of Forth and Tay many villages are inhabited by fisher-folk who reap the harvest of the North Sea fishing-grounds, like the people of Grimsby.

Dundee and **Dunfermline** are the centres of **linen** factories. **Hamilton** and **Motherwell** are **iron** towns. **Glasgow** is the chief port of Scotland, and ranks equal with Manchester as the fourth port in the kingdom. From Glasgow down the Clyde there are numerous **shipbuilding** yards.

Paisley and **Renfrew** are **cotton** and **woollen** factory towns.

Kilmarnock is an **iron** town on the Ayrshire coal field.

Glasgow exports iron goods from local works, just as Liverpool exports iron goods from Birmingham and Sheffield. Glasgow exports ships in the same way as Newcastle.

The Scottish coasts.—The west coast of Scotland is notable for the industries of the Firth of Clyde and the ports of Glasgow and Greenock. The east coast has, however, many more towns and ports. Along the Firth of Forth are many coal ports, such as Methil. Further north are the fishing towns of Forfarshire, and the port of **Aberdeen** with its industries connected with granite, cattle and fish. On this coast is **Leith**, the port of **Edinburgh**, the capital city.

North-east Ireland.—Ireland has no coal fields of any magnitude, so that the density of population in the **Belfast** district is somewhat of a curiosity. Coal is obtained across the North Channel and the Irish Sea, and iron is obtained from Barrow; for Belfast is a great shipbuilding centre. **Flax** is grown locally, and supplies are imported, so that Belfast is the centre of the **Irish linen** trade. The neighbouring district is notable on account of the extensive growth of oats (Fig. 159) and potatoes (Fig. 162).

Irish ports—**Dublin**, the capital of Ireland, is used as a port, although much of the traffic goes from the neighbouring ferry town of **Kingstown** to Holyhead. **Cork**, in the south, has an outport, **Queenstown**, where large ships may call, but many small ships use Cork in connection with the trade in agricultural produce. **Londonderry** has an outport, Moville, at which ocean liners call. **Greenore** and **Rosslare** are ferry towns on the Irish Sea.

Metropolitan England.—Because London is the Metropolis, and because the workers of London sleep in the towns and villages which are dotted along the railway lines which radiate from London in all directions (Fig. 172), even so far as **Southend** to the east and **Brighton** to the south, the whole south-east of England may be called Metropolitan England.

Along the Thames valley westwards, as well as some distance into Essex, Hertford, Surrey and Kent, even the people who work

outside the London area are supremely interested in the prosperity of the great city. Some are **market-gardeners**, who supply fruit and vegetables to London markets; others are **dairymen**, who cater for the London milk trade; still others are **graziers**, who fatten cattle and sheep intended for the London butcher.



FIG. 172.—THE POSITION OF LONDON.

The townspeople are small traders and shopkeepers, whose livelihood is obtained by catering for the families of London workers who use the outlying towns as *dormitories*.

London vies with Liverpool as the world's greatest port; but because London is distant from the coal fields and from the great factory districts, the imports are more than twice as valuable as the exports; while Liverpool, as the port for the factories, has imports and exports of almost equal value. From the countries in the East, British imports, such as tea, wool, tin, come chiefly to London, which is the terminus of the great steamship routes which use the Suez Canal. Liverpool, on the other hand, is the terminus of the routes for steamers to America and West Africa, and imports cattle, beef, rubber, and, of most importance, raw cotton. Owing to

its position as the centre of the British Empire, London is the great *entrepôt* port of Britain. Wool and tea are re-exported from London to the continent of Europe.

London is too great to have one great industry, but there are numerous factories of all kinds within the city. Clothing factories such as those of Leeds, metal workers such as those of Wolverhampton, silk factories such as those of Bradford or Stockport, flour-mills such as those of Hull or Bristol, are but a few examples of the concentration of all kinds of industries in the Metropolis.

EXERCISES.

1. Name the chief cotton manufacturing centres in Great Britain and in Europe. (Vict. Ed. Dept.)

2. Describe the position of the "Black Country." Between what river systems is it enclosed? Illustrate your answer by a sketch map. Mark on this map the chief town of the district, and describe and account for its trade. Indicate the coal-field. (*O.U.L.)

3. Name and indicate the position of ten towns in the British Isles (two for each industry) in which the following industries are carried on : Cotton, linen, wool, hardware, shipbuilding ; explain why each locality has been chosen. (*C.U.L.)

4. Mention the important coal fields in Great Britain. Indicate as exactly as you can the position of each ; name a great industry (other than mining) in each, mentioning one important town where that industry is carried on. (*C.U.L.)

47. Britain. Communications, etc.

1. Arrivals of Oranges into London (percentages).

SPAIN.				PORTUGAL.		SYRIA.	SICILY, ETC.
Murcia.	Valencia, etc.	Almeria.	Malaga.	Lisbon.	Oporto.	Jaffa.	—
7	80	9	—	2	—	1	1

Trace a copy of Fig. 146, and insert arrow heads on your traced map to show the places which send oranges to London. Consider the list (p. 307) which shows the dates of arrival of oranges in Britain. Is there any month in the year at which oranges do not arrive in Britain? California and Florida grow oranges in different climates ; what feature is common to both

climates? In which kind of climate are most of the oranges sent to Britain grown?

2. Arrivals of Lemons in London.

From—	ITALY.	SICILY.		SPAIN.	
	Naples.	Messina.	Palermo.	Malaga.	Murcia.
Per cent. - -	13	25	51	6	5
Months of large supplies	June-Aug.	Nov.-Feb.	Feb.-June.	Oct.-Nov.	June-Aug.

Indicate on the traced copy of Fig. 146 the routes by which lemons are sent by the growers to London. Is there any month in the year on which supplies of lemons are not received in Britain? What is the kind of climate in which lemons are grown?

3. Arrivals of Onions into Hull.

From—	Egypt.	Spain.	Holland.	Rest of Europe.
Per cent. - - -	41	28	26	5

What other countries than those named above send onions to Britain? How is the supply of onions maintained all the year round? What similarity exists between onions and the characteristic plants of arid regions?

4. Arrivals of Potatoes into Hull.

From—	France.	Germany.	Holland.	Jersey.	Rest of Europe.
Percentages -	10	6	16	67	1
Month of largest supplies - - }	April.	April.	April.	June.	—

From what other sources than those named above does Britain obtain potatoes? Examine Fig. 162, and note the situation of Hull with regard to the chief potato districts of the British Isles. Why do the largest foreign supplies arrive in April?

The feeding of Britons.—All the chief British ports import food-stuffs, because Britons only grow about half their food supply themselves.

Food-stuffs like mutton and beef; apples; wheat; dried fruits like raisons and figs, can be transported long distances oversea, because arrangements, such as the *refrigerating chambers* for the meat traffic, have been made to preserve the food during the voyage.

Article.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Apples - -	CDEF	CDEF	DEF	ABDEF	AB DEF	AB	AB			C D EF	C D EF	C D EF
Grapes - -	C	CL	CL				H	GH K	G K	G K	G K	G
Lemons -	M	M	MN	MN	MN	MN	MN	MN	HN	HN	H M	H M
Oranges -	PMH ST	PMD HST	PMD ST	D T	N T	N T	QN T	AO QN	AON QR	G P Q R	G P Q M H	PO M T H
Potatoes -	VW	VW	VY	VK Y	VX KY	VX KY				W	W	VW
Onions - -	ba	ba	b	Z	Z	Z	Kb	Kb	Kb	Kb	Kb	ab
Plums and prunes }										c	D	
Pears - -				A	A	A	A	ac D	ac D	ac D	ac D	ac
Cocoa - -	df	df	f	f	f	f	f	f	ef	f	f	f
Coffee - -	g	g					O		Q		g	gd
Rice - - -		h	h	k				l	l			
Tea - - -	d	d	d	d	k d	d m	d m	d	d	d	d	d

A = Australia. B = Tasmania. C = U.S.A. D = California. E = Canada. F = Nova Scotia. G = Almeria (Spain). H = Malaga (Spain). K = Lisbon (Portugal). L = Cape of Good Hope. M = Messina and Palermo (Sicily). N = Naples (Italy). O = Brazil. P = Jaffa (Syria). Q = Jamaica. R = Florida (U.S.A.). S = Seville (Spain). T = Murcia (Spain). V = Canary Islands. W = Germany. X = Jersey (Channel Islands). Y = Malta. Z = Egypt. a = Italy. b = Valencia (Spain). c = Bordeaux (France). d = Ceylon. e = West Africa. f = Central America. g = Arabia. h = Rangoon (Burma). k = India. l = Java. m = China.

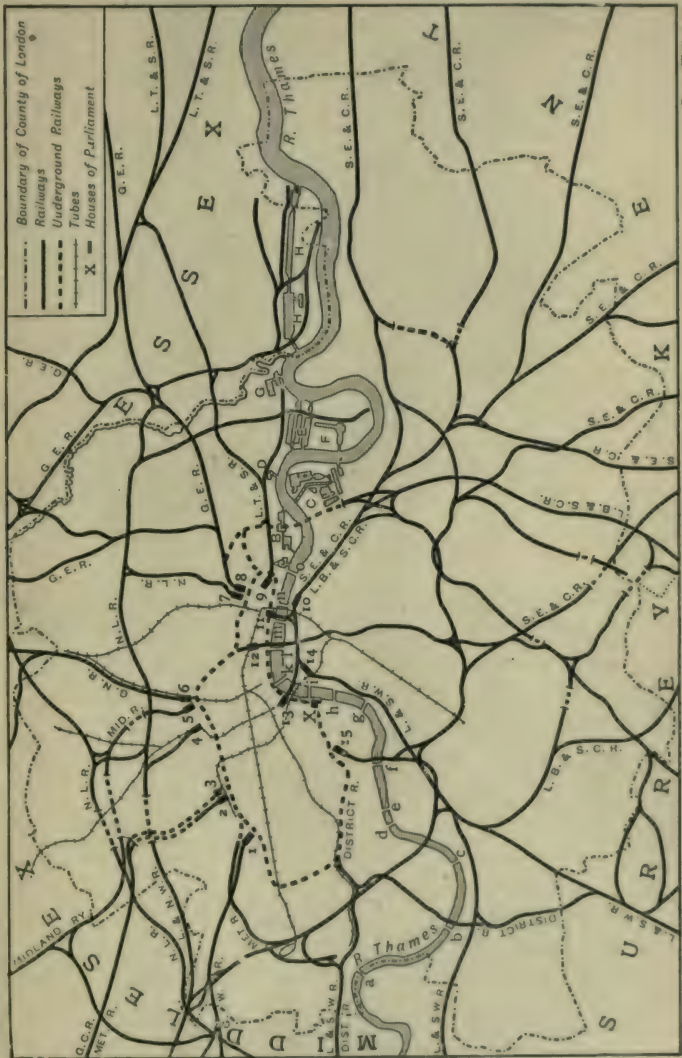
Other foods are more perishable, and can only be obtained from foreign countries which are within short distances; consequently, large proportions of such foods are obtained from the Continent.

The position of London, which is a great food-market, in relation to the Continent, is important in this respect. London is nearer to North France than it is to Ireland.

All the year round supplies.—The requirements of Britons as regards food supplies have to be met from week to week : it is calculated that at no time is there sufficient food-stuff in the British Isles to feed the people for a month. It is the business of provision merchants, fruit brokers and similar traders to ensure the regular supply of food, and an attempt is made in the table on p. 307 to illustrate for some articles how such men draw supplies at different times from different countries. When the home harvest is available, then foreign supplies are not required, but when the home supply is exhausted, then, in turn, according to the date of their harvest, foreign lands are called upon for part of their surplus produce. For example, potatoes are obtained from abroad regularly except from July to September.

Traffic in the English seas.—Fig. 172 illustrates the position of London. The four circles show distances as the crow flies by what is called an air line. The numbers against the towns show the distances which the traveller actually covers from the appropriate railway station in London. The *ferry service* of steam-boats from **Harwich, Queenborough, Dover, Folkestone, Newhaven** and **Southampton** makes it possible for passengers and goods to reach London quickly from the ferry towns, **Hook of Holland, Flushing, Ostend, Calais, Boulogne, Dieppe**, across the Channel. Travel by rail is quicker than travel by steam-ferry ; consequently, the traveller may reach Fishguard or Holyhead in $5\frac{1}{2}$ and Liverpool in 4 hours from London by the fastest express, while Flushing can only be reached in $7\frac{1}{2}$ hours by express train and steam-boat. The ways in which railway lines radiate from London are illustrated merely by Fig. 172, since the Great Central and Midland lines are omitted and the complete service of the other railways is not shown.

Fig. 173 shows the London lines of traffic more completely. This map shows many important facts : *e.g.* (i) the way in which the flat lands surrounded by the meanders of the Thames have been used to accommodate the docks, (ii) the way in which the railways tunnel underground either to avoid the hills or to avoid the crowded buildings. The surface traffic of London cannot be entirely shown ; for London workers reach their places of employment from the suburban *dormitories* by motor buses, by the London County Council system of electric trams, as well as by the underground tubes which are marked on the map. A river is a barrier of communication : man has conquered the barrier of the Thames, by the



Emery Walker & Co.

FIG. 107.—LONDON: COMMUNICATIONS.

bridges which are lettered from *a* to *n*, while railways cross the river by bridges or tunnel under the bed of the stream.

These two maps mirror but imperfectly the vast concourse* of people and the vast traffic in passengers and goods which characterise the Metropolis.

EXERCISES.

1. On an outline map of the British Isles insert two routes from London to Ireland, marking the ports of departure and arrival, and the railway routes to the points of departure. Name, without boundaries, the Welsh counties which fringe the coast, and Loch Foyle, Morecambe Bay, North Channel and the Shannon estuary. Mark and name the towns of Whitehaven, Plymouth and Portsmouth. (C.S.C.)

2. A number of sea-ports in the British Isles are used as calling-places by ocean-going mail steamers. Name and describe the positions of *two* such ports, and explain fully why they are so used. Indicate on a map the routes connecting the ports you name with London. (*O.U.L.)

3. State the name and describe the position of an English port at which you could embark on a journey from London (*a*) to Paris, (*b*) to Hamburg, (*c*) to the Channel Islands. Describe in detail the English portion of one of these journeys. (*O.U.L.)

TEST PAPER.

1. Name two adjoining counties in Great Britain whose products are mainly agricultural, and two adjoining counties where they are mainly industrial, and describe each group briefly, giving the products. Note the geographical reasons for the conditions you describe. (C.S.C.)

2. Describe the positions of the Scottish coal fields, and give an account of the industries which are based on them. (*O.U.L.)

3. Name in order, state for what they are noted, and give an account of the industries of, *four* important towns situated on one of the following railway routes between London and Edinburgh: (i) the London and North-Western and the Caledonian, or (ii) the Great Northern, North Eastern, and North British, or (iii) the Midland and the Caledonian. (*C.U.L.)

4. How is it that—

(*a*) London has become the greatest town in the world?

(*b*) Lancashire is a great *cotton* county?

(*c*) Ireland has an "oceanic" climate?

(*d*) Cornwall and Devon send clay to North Staffordshire? (C.P.)

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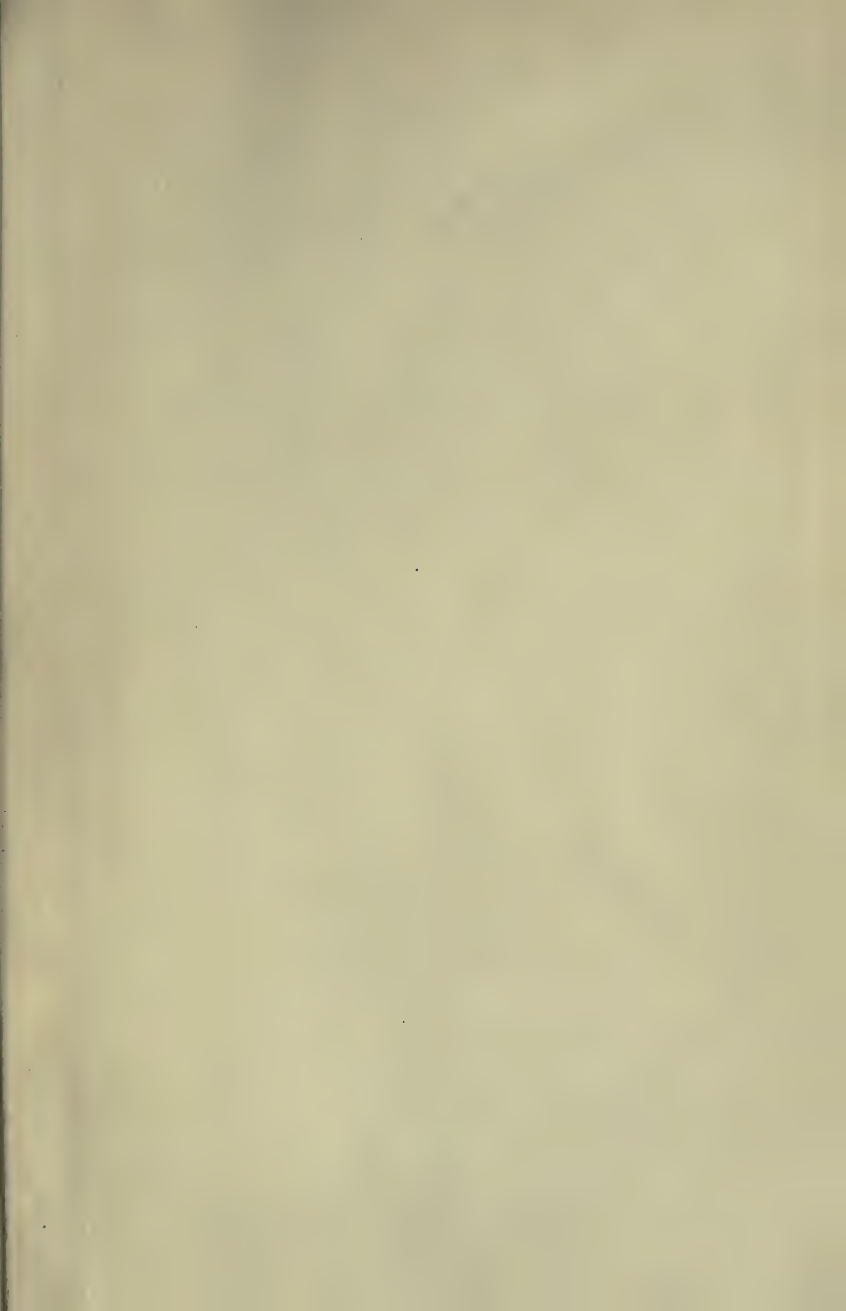
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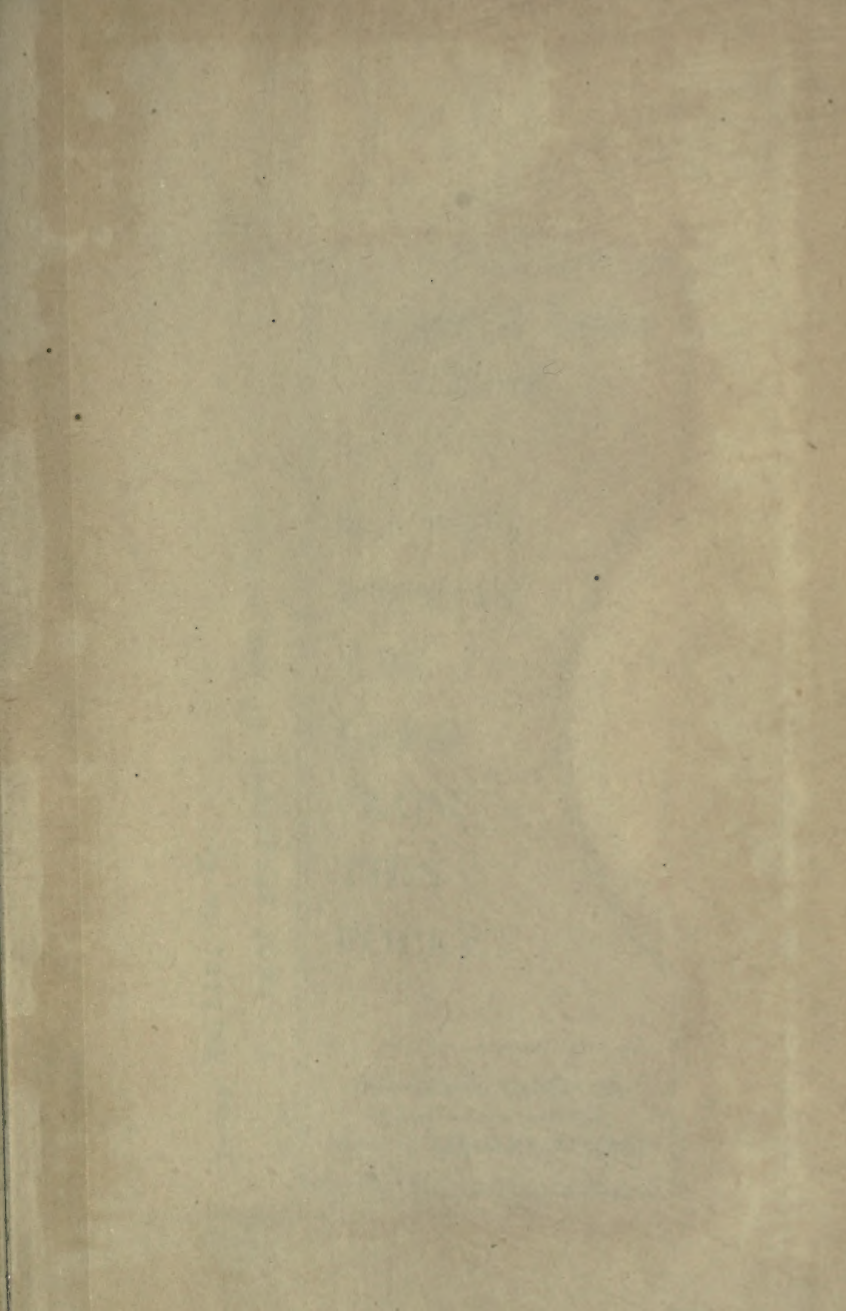
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